

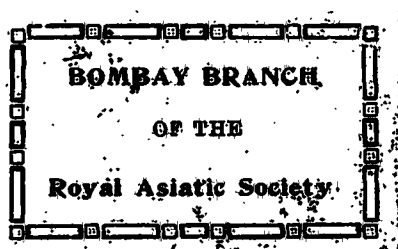
Annual Report
of the
Department of Agriculture
in the Bombay Presidency

For the Year 1930-31

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY, 1930-31

CHAPTER I

FEATURES OF THE YEAR

The year 1930-31 must be written down as having provided one of the most satisfactory agricultural seasons since the War, if all parts of the Presidency and both seasons are lumped together. Of course there were some localities where conditions were unfavourable, notably the Dharwar District where the cotton crop was a poor one.

There were no great physical catastrophes in the form of famine, floods, or plagues, although the disease, called *Rhizoctonia bataticola*, turned an otherwise bumper rabi jowar crop, in the East Deccan, into a moderate crop.

The outstanding feature of the year took another form. This was the world-wide Economic Crisis which struck a devastating blow at the Agriculture of the Bombay Presidency. The slump set in about May 1930 and became crushing by the winter of 1930 when the kharif crop began to come on to the market. Hence, although crop-outturns were good, income was small owing to the slump in prices.

The following statement tabulates the fall in the prices of staple food-grains between May 1930 and May 1931 :—

Retail prices of staple Food-grains in seers and chhataks per rupee

Name of grain and date		Name of place						
		Ahmed- abad	Surat	Nasik	Shola- pur	Dhar- war	Thana	Ratna- giri
		S. ch.	S. ch.	S. ch.	S. ch.	S. ch.	S. ch.	S. ch.
Jowar	May 1930	.. ..	7 14	.. ..	12 8	12 4	.. ..	.. ..
	October 1930	.. ..	9 4	.. ..	14 2	13 12	.. ..	.. ..
	December 1930	.. ..	11 9	.. ..	22 3	16 10	.. ..	.. ..
	May 1931	.. ..	12 0	.. ..	27 6	24 4	.. ..	.. ..
Bajri	May 1930	.. 7 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
	October 1930	.. 9 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
	December 1930	.. 13 8	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
	May 1931	.. 13 0	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
Rice	May 1930	.. ..	.. ..	.. ..	.. ..	.. ..	5 11	6 3
	October 1930	.. ..	.. ..	.. ..	.. ..	.. ..	5 11	5 14
	December 1930	.. ..	.. ..	.. ..	.. ..	.. ..	7 2	7 6
	May 1931	.. ..	.. ..	.. ..	.. ..	.. ..	7 1	9 0
Wheat	May 1930	.. ..	.. ..	6 12	.. ..	.. ..	.. ..	.. ..
	October 1930	.. ..	.. ..	7 14	.. ..	.. ..	.. ..	.. ..
	December 1930	.. ..	.. ..	9 12	.. ..	.. ..	.. ..	.. ..
	May 1931	.. ..	.. ..	12 0	.. ..	.. ..	.. ..	.. ..

Some ordinarily sane observers almost lost their heads and made wild demands for Government relief, supporting their arguments with figures which indicated that agricultural produce was selling below the cost of production. Indian Agricultural Economics, however, is an exceptionally obscure subject, and it has become quite clear that "cost of production" has not the precise meaning in a peasant agricultural country that it has in a modern factory or industrial concern or even in British Agriculture where a tolerably accurate cash value can be placed on each item which enters into production. When the price of cotton fell to the order of Rs. 200 per candy for Broach it was freely asserted that the crop was being sold at below cost price and there was some mental speculation upon the probability of the next season's crop shrinking to relatively small dimensions. This has not happened. The early estimates of the India cotton area of 1931-32 put the aggregate at only some six per cent. below the 1930-31 figure. The area of the early crop in the Bombay Presidency is estimated (10th August 1931) to be $2\frac{1}{2}$ per cent. above the corresponding figure of 1930-31.

A couple of years ago business firms drew attention to the bid which was being made by Africa to capture the groundnut market; and enquiries were made of the Department: what is the limiting price for groundnuts at which the Indian grower finds it unprofitable to grow the crop? At that time it was estimated that the up-country limiting price per palla of 240 lbs. of dry pods was Rs. 15 to 17 for Gujarat and Khandesh respectively and Rs. $18\frac{1}{2}$ to Rs. 20 for the Karnatak and South Deccan respectively. The 1930-31 crop was sold at a figure of Rs. 8 to 10 per palla in Khandesh and Rs. 7 to 10 per palla in Satara, and it is significant to record that in spite of this tremendous fall in prices the early estimates of the 1931-32 crop put the groundnut area at only about 18 per cent. below the area of 1930-31 in the Bombay Presidency.

The explanation of these phenomena seems to be that employment is the ruling factor in determining the area sown with a "money" crop in a year when there is a general fall in price-levels. Relatively little cash is saved by leaving land unsown in a peasant tract. Hence so long as cotton or groundnuts bring in more cash than grain crops large areas will continue to be sown with the former. These large areas, however, should not be allowed to blind Government to the fundamental gravity of the agricultural situation. In this crisis agriculture should be given the utmost practicable support.

An impressive rural economic feature of the year has been the call made on the savings of the people which take the form of precious metals. Thus it is reported that 40,000 tolas of gold were despatched from Jalgaon to Bombay in July last. At the annual general meeting of the Imperial Bank of India, which was held in Bombay on the 17th August 1931, it was stated that some 9 crores of rupees of gold had flowed into the Mint during the preceding six months.

One of the great handicaps of Agriculture, as compared with other great interests, is the lack of organization among agriculturists. It is, however, gratifying to observe that there is a growing tendency for sections of the industry to take up the question of organized action. Bombay Presidency already has its—

Presidency Cattle-Breeding and Dairy-Farming Association and its

Presidency Poultry Association

and now, in the year under report, there has come into existence the

Bombay Presidency Fruit Growers' Association.

The scope for useful work open to the latter Body cannot be exaggerated; and in the Association's Appeal for members the following significant information is vouchsafed:—

- (a) 71 per cent. of the retail price of fruit is taken by the middleman,
- (b) 18 per cent. is absorbed in freight etc., and
- (c) 11 per cent. only goes into the pocket of the producer.

Financing Agricultural Research.—The all-important research work of the Department would have been greatly jeopardized, as a result of the economic crisis, if it had depended wholly for its finance upon Government. Fortunately the Department is receiving substantial financial assistance from three external sources, namely, the Indian Central Cotton Committee, the Sir Sassoon David Trust and the Imperial Council of Agricultural Research. A new potential source of finance for research arises out of the Report of the Hides Cess Enquiry Committee, dated 4th February 1930. This Committee has recommended that—

- (1) a cess at the rate of 1 per cent. should be levied on the value of exported hides, which cess is estimated to bring in Rs. 7·33 lakhs per annum, and
- (2) a Statutory Committee should be set up to administer this cess on the lines of the Indian Central Cotton Committee.

The main object of these recommendations appears to be to finance research and instruction on behalf of the Leather and Tanning Industries. This proposal seems to overlook the fact that hides are an agricultural product and that this entitles Agriculture to be the principal beneficaire of the cess. In particular it seems reasonable to suggest that the cess should be spent in promoting research and propaganda within the Livestock Industry in the broadest sense (including the tanning and leather industries). If this view prevails then substantial funds should become available for research upon cattle-breeding and nutrition and for providing the services of premium bulls.

CHAPTER II

AGRICULTURAL DEVELOPMENT

I propose to discuss this problem under the following seven subjects:—

- I—The Exploitation of Canal Irrigation.
- II—The Better Utilization of the Rainfall.
- III—The Purity and Uniformity of Agricultural Produce.
- IV—Marketing Reforms.
- V—The Provision of Fodder.
- VI—The Bombay Presidency Milk-Supply.
- VII—The Rôle of Machinery.

THE EXPLOITATION OF CANAL IRRIGATION

Government have invested Rs. 10·85 crores (capital and accrued interest taken together) in supplying the Deccan with Canal irrigation, but owing to lack of agricultural development Government incurs an annual loss of half a crore of rupees on this investment,* apart from indirect returns.

It has in fact been made quite clear that the conversion of jirayat land into bagayat land on the blacksoils of Peninsular India is not a simple proposition. The mere construction of canals does not solve the problem because the people for various reasons cannot easily avail themselves of the water. Numerous incidental problems arise such as pertain to—

- (1) the labour supply (both men and cattle),
- (2) the manure supply,
- (3) the command of capital,
- (4) the cost of production,
- (5) the damage to the soil,
- (6) the water-logging of the country-side.

So long as the area under irrigation remained comparatively small most of these problems did not declare themselves with the intensity which has characterized the position in recent years. For example the surrounding jirayat villages were combed for farm-yard manure and surplus labour, and the market for gul was equal to the supply so that sugarcane cultivation could be profitably conducted on an artificial basis ; for example the cane-grower could afford the luxury of getting all the operations done by contract labour including ploughing the land in addition to purchasing vast quantities of nitrogenous fertilizers. It is the exception, throughout the

*Vide paragraph I of the letter of the Settlement Commissioner and Director of Land Records No. S.T. 707, dated 3rd October 1930, printed in the preamble of G. R., P. W. D., No. 2353/27, dated 26th January 1931.

world, for agriculture to prove a business proposition if conducted on these lines. The artificial character of this system has been well illustrated during the great economic slump. Cane cultivation conducted on these lines has become unprofitable (except perhaps to the most skilful managers) whereas the peasant with a well has not only been able to survive, but, in some cases, to expand his business.

In order to promote sound and stable agricultural development in the canal tracts it seems necessary for Government to formulate a comprehensive policy of development which will embrace, *inter alia*, provision for assisting the agriculturist under the following headings :—

Finance,

Promotion of Agricultural Industries,

Colonization,

Technical propaganda and services, particularly agricultural,

Drainage.

Most of the country-side through which the canals pass, is at the outset, in a poverty-stricken condition. The people have been subjected to famine conditions for generations, and in consequence they have little or no capital, if they are not actually heavily in debt ; they have a very limited knowledge of irrigation-agriculture ; they are illiterate and they suffer from a lack of enterprize due to restricted opportunities in the past.

Finance.—In these circumstances the people have not the capital necessary for laying out their lands and cultivating expensive crops. It seems quite necessary to devise a method for financing these agriculturists of a simpler character than ordinary Co-operative Finance. It should contain the following three features (a) long-term, (b) low-interest, and (c) “in kind” rather than “in cash” so far as possible.

Promotion of Agricultural Industries.—Successful irrigation-farming on black soil demands a liberal supply of organic manure, of which animal dung is the most usual form. Hence a thriving livestock industry should always be fostered in a canal tract. It may take the form of dairying or sheep-farming or cattle-rearing or something else according to circumstances. For this purpose special facilities for producing fodder in the fair season, particularly in the hot-weather should be a cardinal feature of any Development Policy ; and in this connection it seems worth while considering whether

it is not possible to provide fodder-reserves (kurans) at suitable centres within the canal zone. Such kurans might be irrigated with the surplus water of the monsoon season, which is not required by irrigated crops. Such kurans would be invaluable for the cheap maintenance of plough-bullocks in the slack season and of dry milch-stock and young-stock.

The establishment of a Sugar-Industry on the Deccan Canals is worthy of very serious consideration because sugarcane is peculiarly well adapted for cultivation in the Deccan, but the market for gul (raw-sugar) appears to be decidedly limited. In view of the 15-year protective duty on sugar recently recommended by the Tariff Board there seems to be an unique opportunity for promoting this industry. Government could assist in several ways such as devising means of providing the land; and subsidizing the technical service essential in sugar-manufacture.

There is a third industry namely Fruit which has great potential importance. There are about half a dozen fruits which grow sufficiently well in the Deccan to provide the foundation of a big fruit industry. These include the mango, the citrus-group, the banana and the grape-vine. Of these perhaps the sour-lime is the most immediately promising large-scale commercial proposition, because it provides the raw material of Swadeshi lime-juice for which there appears to be a huge potential market in India.

Colonization.—As the country served by the Deccan Canals is already occupied and there is practically very little waste land colonization must necessarily be given a restricted meaning. What is required is the inoculation of the canal tracts with selected colonists with reference to special skill in the cultivation of valuable crops, e.g. a few Dairy-farmers from Kaira District would be an asset; similarly the presence of some expert tobacco-growers from Belgaum District might pave the way to a tobacco industry; while some of the Satara well-sugarcane growers could provide a salutary demonstration in the economical production of cane.

Technical Propaganda and Services.—There is a huge field on the new canals for teaching the jirayat farmers how to prepare their lands for irrigation by suitable levelling and laying-out and secondly in the practical art of how to grow irrigated crops. With the aid of the Imperial Council of Agricultural Research an important scheme of Agricultural Research is being launched on the Nira Right Bank Canal and

it is anticipated that the new knowledge brought to light will materially supplement the improvements already in the hands of the Department of Agriculture as the result of valuable research carried out at Manjri in years past. Hence there is plenty of material existing and potential for an intensive campaign to be launched with regard to irrigation-agriculture in the canal tracts, especially the new areas. This, however, requires a special propaganda staff and the provision of such should be an integral part of a Development Policy.

Drainage.—A huge amount of damage has been caused in the canal zone through water-logging. The Special Irrigation Department have brought this menace to the prosperity of the tract, under control and have devised a system of major-drainage which is intended to prevent further water-logging and to drain the present water-logged areas. But funds are necessary and this objective appears amply to justify the proposed cess or some other means of providing the necessary funds.

THE BETTER UTILIZATION OF THE RAINFALL

A large part of the central portion of Peninsular India embracing portions of the Bombay Presidency, Hyderabad State and Madras Presidency suffers from a deficient rainfall and there have been innumerable famines and scarcities throughout this tract for centuries. Every year this happens at one place or another while more rarely there is a general famine. Investigation shows that this trouble is not due entirely to shortage of rain, but on the contrary crop-failure is frequently the consequence of (1) faulty distribution and (2) the loss of much of the actual rain-water through run-off. The rainfall is of the order of 20 inches per annum but in some localities the average is as low as 15 inches or as high as 30 inches. For practical purposes it comes during the monsoon period of June to October but there may be some rain in November. There are two peak-months, namely June and September but the latter receives the greater amount of rain. A peculiar feature of the rainfall is its remarkable compression into a few effective rainy days; the bulk of the rain falls within a period of 15 days. Thus the precipitation takes the form of heavy down-pours and this is the reason why as much as fifty per cent. of the effective rain may run to waste the moment it falls. There are two operations which can be adopted to mitigate this catastrophe—

(1) Embanking the fields; and

(2) Causing the water to become absorbed in situ through suitable tillage operations.

The Department of Agriculture employs four full-time subordinate officers on Embankment work. They prepare plans and estimates for embanking schemes and render most valuable assistance to agriculturists who generally, when left to themselves, waste much time and energy in constructing their tals (embankments) on faulty alignments and in putting in their waste weirs at wrong positions. The work of these officers in the year under report will be found under "Services Rendered" on page 27 of this Report.

The scope for such development can be gauged from the fact that the Collector of Bijapur gave out Rs. 12 lakhs in takavi advances to the Indi Taluka alone during the four years 1927-1930. Most of this money was invested in embankments but part of it went into new wells which constitute another fundamental form of agricultural development. It has recently been computed that the average amount of capital per village which might usefully be sunk in embankments in the Bijapur District is Rs. 1½ lakhs and there are some 1,200 villages.

The other operation of causing the water to become absorbed through the application of suitable tillage methods constitutes what is known as Dry-farming. The Department has a small Research Station where this subject is being scientifically investigated and already it has been found possible to apply some of the results to practice in the country-side. In fact vigorous propaganda has been carried on in several parts of the Deccan and substantial areas have been managed in accordance with the technique recommended by the Department as may be gathered from the detailed information recorded on page 59 of this Report.

In order to develop our knowledge to the fullest extent on this subject an enlarged Dry-farming Research Scheme has been submitted to the Imperial Council of Agricultural Research for financial support as explained more fully on page 39 of this Report.

THE PURITY AND UNIFORMITY OF AGRICULTURAL PRODUCE

A common complaint against Indian produce in foreign markets is its lack of purity and standardization, not to mention adulteration. There can be no doubt that Indian produce does fetch a substantially lower price than it need do even in the Indian market because of these defects.

In recent years vigorous action has been taken by the Indian Central Cotton Committee to ensure that important trade types

of cotton shall be grown in bulk in pure condition and be marketed free from admixture. To this end the Cotton Transport Act, 1923, and the Cotton Ginning and Pressing Factories Act, 1925, have been put on the statute book.

In this way the Bombay Department of Agriculture has been able to bring about the establishment of seven protected cotton zones as noted in the margin. The latest zone to be notified, as protected, is known as the Nerbudda-Mahi Zone and is located in Middle Gujarat; the Notification Order for which is dated 11th May 1931. By this means it is hoped to raise the reputation of the tracts concerned and to secure better prices for the grower through greater confidence in the buyer. This Act has worked very well in the Southern Division of the Bombay Presidency in the year under report, and it may be of interest to record that 1,087 import road-licenses and 111 import rail-licenses were issued by the Department for the importation of 14,565 and 1,279 dokras (1,344 lbs. of seed-cotton) respectively into the Gadag market from outside the protected zone; these licenses are granted for approved cotton only. The Cotton Ginning and Pressing Factories Act is also working well and one of the incidental advantages is that the statistical returns from the presses are proving a very useful check upon the Department's Statistical and Forecast work.

The South Surat Area.
The Surat Area.
The Olpad-Ankleshwar Area.
The Bagalkot Area.
The Bijapur Area.
The Kumpta-Dharwar Area.
The Nerbudda-Mahi Zone.

MARKETING REFORMS

The Report of the Royal Commission on Agriculture in India laid great stress upon the need for improving the marketing of agricultural produce.

The chief effort so far made in this Presidency has been the passing of the Bombay Cotton Markets Act (1927). This provides for the establishment of regulated cotton markets. Progress made in the year under report will be found on page 32 of this Report.

Accordingly the first regulated cotton market in the Bombay Presidency was brought into existence at Dhulia in the year under report, and as a result of the good-will of the Dhulia cotton merchants it was possible to give this new type of market an excellent start. Although this market did not come into operation till 1st December 1930 the business

conducted was satisfactory as may be gauged from the following figures for the period ending 23rd May 1931.

Number of carts arrived in the market			Fees collected in rupees					Disputes settled	
Seed cotton	Clean Cotton	Cotton waste	Licenses to brokers, weighmen, etc.	Seed-cotton	Clean cotton	Cotton waste	Total	by Superintendent of market	by Subcommittee
32,522	1,296	96	2,145	4,065	486	12	6,708	167	9

It is hoped to establish a second regulated market at Amalner in the coming year 1931-32.

Passing mention should also be made of the Cotton Contracts Control Bill which was withdrawn by Government at the July 1931 Session of the Legislative Council. This Bill aimed at amending the Bombay Cotton Contracts Control (War Provisions) Act, 1919. This Act provides for the Control of Transactions in Cotton in Bombay, in response to the desire from the Trade itself that cotton trading in Bombay should be controlled by Legislative enactment. The Bill aimed at entrusting this control to a single Body, namely, the East India Cotton Association, with modified articles of Association, which would make rules and bye-laws for the control of trading in cotton in the Islands of Bombay only, subject to the approval of Government. There would be no control over prices, but these would be registered daily. The underlying object of the Bill was to minimize speculation. It appears that the Bill failed because there was a feeling that the growers should be more strongly represented on the East India Cotton Association and because that Body, as constituted, does not command universal approval.

Several activities connected with the better marketing of agricultural produce will be found on pages 31 to 35 of this Report.

THE PROVISION OF FODDER

One of the least satisfactory features of the rural economy of India is the inadequate feeding of the cattle. One rarely, if ever, sees village cattle in good condition throughout the year and more often than not the cattle fall into an emaciated condition during the hot-weather. This unsatisfactory state of affairs is said to be due to too much attention being devoted to the raising of money crops, but it is also very largely due to the farmer not making adequate provision for his cattle by conserving his fodder resources.

It is gratifying, however, to be able to record that in the last few years where premium bulls have been getting good stock there is a distinct improvement in the feeding of the improved cattle.

In connection with the fodder problem the Forest Department render a valuable service in protecting zones into which livestock are admitted for an almost nominal fee. For some time past the Department of Agriculture has been giving special attention to the problem of improving the grazing lands of the Bombay Presidency, and Dr. Burns has now worked out a technique for the scientific management of these lands with the aid of a grant from the Trustees of the Sir Sassoon David Trust, and it is gratifying to record that the Forest Department are prepared to give a large scale trial to these methods with a view to their ultimate adoption. Arrangements have accordingly been made to test these methods on an area of 2,000 acres of Forest land at Diva Ghat near Poona. Reference to the possible creation of fodder reserves at suitable centres in the canal zone, has been made under "Canal Irrigation" above.

THE BOMBAY PRESIDENCY MILK SUPPLY

There is too little milk in the countryside and the price is too high, even in the interior villages. For example on the Godavari Canal the village of Mahalkhedra with a population estimated at 3,000 souls depends for its milk supply on seven buffaloes. In this tract the price of milk is 2 annas per lb. Similarly the great cities like Bombay (consumption per day 3 lakhs of lbs.) have an entirely inadequate supply of milk. The consumption per capita per day in Bombay works out at 3 ozs., and the price of class A milk, which is pure milk, is 5 annas per lb., while ordinary (watered) milk sells at 3 annas per lb.

Moreover the existing system of keeping the milch animals which supply the city of Bombay with milk inside the city limits, is not only one of the causes of the high price of milk, but it is an agricultural economic drain on the country, because the buffaloes, and they are mostly high class animals, are slaughtered as soon as their lactation period is over because it is too expensive to maintain dry animals in Bombay. There are upwards of 16,000 such buffaloes always in Bombay and a scheme is under consideration to remove these animals to a suitable tract in Palghar Taluka, where they can be maintained throughout their lives.

Reference has been made above to the importance of fostering the dairy industry as a means of developing the canal tracts of the Deccan and it is just possible that the establishment of a dairy industry in the irrigated zone of Nasik or Ahmednagar District might prove the best solution of the Bombay City supply problem.

THE RÔLE OF MACHINERY

The contributions which machinery is making to the development of Agriculture in the Bombay Presidency may be summarized under the following headings :—

I—Boring for water.

II—Pumping water.

III—Driving cane-crushers, oil-mills and cotton-gins.

IV—Ploughing weed-bound land.

Boring.—During the past 22 years the Department has conducted boring operations primarily to augment the well-water supply. During this period over 2 lakhs of feet have been bored and over 3 million gallons of water per hour have been tapped. Further details will be found on page 26 of this Report. The inclusive cost of boring has varied from Rs. 6-6-4 to Rs. 10-3-8 per foot according to circumstances, while in some cases it has gone above the latter figure. By the adoption of sundry economies it is believed that average boring should not in future cost more than Rs. 5-8-0 and Rs. 7 per foot on Musto Patent and Calyx machines respectively. Unfortunately operations have had to be temporarily suspended owing to financial stringency, but the work is so valuable that it should not only be resumed but expanded because well-cultivation is a particularly desirable form of agricultural development to encourage in a peasant country like the Bombay Presidency.

Pumping water.—The Department has done a great deal of pioneer work in promoting this form of development which is closely akin to the last mentioned. It has, however, proved to be an up-hill task especially when the pumping-plant is intended to benefit a group of persons. Experience has shown that the selection of the right people is an even more important factor underlying success than selecting the best river or other sites. A very fine pumping plant erected at Nandgaon in Poona District had to be closed down not for technical reasons but because the local people could not be organized to make proper use of the water, and a somewhat

similar fate overtook a fine pumping plant installed on the Bhima river at Bhambora in Ahmednagar District. Where, however, the right persons are selected these pumping installations are very successful. It is interesting to take stock of the localities in which this type of development is meeting with most success. The Chikodi Taluka of the Belgaum District is one such centre, Indi and Bijapur Talukas are other centres.

Driving Cane Crushers etc.—It is not many years ago since there were no power driven cane-crushers in the Bombay Presidency, but as a result of Departmental demonstration and mechanical assistance there are now 81 installations on the Deccan Canals alone. The latest example of such a plant designed and erected by the Department for an Irrigator, is the one recently opened by the Chief of Phaltan. This consists of a combined power-plant consisting of gins, oil-mills and a cane-crusher driven by the latest type of Blackstone Crude Oil Engine, as described in detail on page 28 of this Report.

Ploughing.—Some years ago the Department gave a very full demonstration of steam ploughing in the Dharwar District where it is estimated there are 6,00,000 acres of grass-bound land and where the people pay large sums of money to labourers who laboriously dig the land to a considerable depth. In the year under report the Department has been collaborating with Messrs. Burma-Shell & Co. to show the possibilities of tractor ploughing for such land. The Firm undertook to do the work provided the Department of Agriculture undertook—

(a) to arrange with Government to make takavi available to agriculturists desirous of getting their lands ploughed by tractor and

(b) to assist in canvassing for the necessary area of land.

Apart from the technical aspect of this work the main condition underlying success is organization. Large areas of land require to be booked in advance in closely adjoining fields so as to keep the machinery as fully and as usefully employed as possible. In certain other parts of this Presidency tractors have been introduced on a considerable scale, notably in Gujarat; but this type of machinery is still in an evolutionary stage and we do not seem to have seen the best of the tractor yet. There seem, however, to be great possibilities about the crude-oil tractors, and there appears to be a fair prospect of such tractors ultimately rendering it possible to bring down the cost of tractor-ploughing to a figure which will prove attractive to agriculturists.

CHAPTER III

SERVICES RENDERED TO THE PUBLIC

SEED OF NEW AND IMPROVED CROPS

Cotton.—In the Karnatak the improved strain of cotton which is being introduced in the Kumpta cotton tract has been given the name of Jayawant (Victorious) because of its valuable character of resistance to wilt disease. For this reason it has superseded the cotton known as Dharwar I which formerly held the field. Jayawant cotton has a good staple being deemed fit for spinning 38 counts warp by the Director of the Matunga Cotton Technological Laboratory against 30 counts in the case of standard Kumpta cotton. The ginning percentage of Jayawant is 28 per cent. against 25 in the case of Kumpta cotton. As regards field-performance Jayawant gives an outturn of 545 lbs. of seed-cotton per acre against 504 lbs. yielded by Kumpta cotton as judged from the average results of three years on Dharwar farm and an outturn of 298 lbs. against 255 lbs. obtained in the District during the same period.

The organization plan for the supply of Jayawant cotton seed consists of five stages of multiplication as shown below :—

Stage	Operation	Area in acres	Quantity of seed produced in lbs.
I	Selfing	A small plot.	120
II	Multiplication on Dharwar Farm	30	8,000
III	Multiplication on Inner Reserved Area.	800	1,50,000
IV	Multiplication on Outer Reserved Area.	15,000	20,00,000
V	Country-side	2,00,000	....

The first two stages, commencing with selfed seed, are carried out on the Dharwar Experimental Station. The third stage is carried out in two villages round about Shirewad in Hubli Taluka (This is called the Inner Reserved Area); the fourth

stage is carried out in a group of villages with Hubli as the centre (This is called the Outer Reserved Area); while the fifth stage is carried out in the country-side served by the Hubli Co-operative Cotton Sale Society in the Talukas of Hubli, Dharwar, part of Navalgund, Shiggaon and Kundgol.

These operations are carried out conjointly by the Department of Agriculture and the Hubli and Gadag Cotton Sale Societies.

In the year (1930-31) under report the scale of Jayawant seed-operations was as tabulated below :—

Stage		Quantity of seed distributed in lbs.	Area sown in acres	Quantity of seed-cotton obtained in lbs.	Quantity of seed stocked for distribution in 1931-32
Name	No.				
Inner Reserved Area ..	III	10,899	1,077	2,49,312	1,66,180
Outer Reserved Area ..	IV	1,43,192	14,936	18,39,936	12,11,280
Country-side ..	V	Nil.	Nil.	Nil.	Nil.

The operations with this cotton will reach the fifth stage next year (1931-32).

The other important cotton in the Karnatak is Dharwar-American and the improved strain evolved by the Department is known as Gadag I. The following statement summarises the principal characters of this cotton contrasted with those of standard Dharwar-American (Saw-ginned Dharwar).

Name of cotton	Highest warp counts	Ginning percentage	Acreage yield of seed cotton
Gadag I	32	33	350
Standard Dharwar-American	20	29	310

Gadag I Cotton is moreover much more resistant to "red-leaf-blight" than ordinary Dharwar-American.

The organization plan for supply of Gadag I cotton seed consists of six stages as shown below :

Stage	Operation	Area in acres	Quantity of seed produced in lbs.
I	Selling	A small plot.	160
II	Multiplication on Seed Farm at Gadag	24	22,000
III	Multiplication on Inner Reserved Area	240	2,20,000
IV	Multiplication on Outer Reserved Area	2,400	2,200,000
V	Multiplication on Extension Area ..	22,000	....
VI	Country-side	200,000	....

In the year (1930-31) under report the scale of seed operations is tabulated below. These operations are located in the following talukas in the east of the Dharwar District :— Gadag, Ron, part of Navalgund and Shiratti.

Stage		Quantity of seed distributed in lbs.	Area sown in acres	Quantity of seed cotton	Quantity of seed stocked for distribution in 1931-32
Name	No.				
Inner Reserved Area ..	III	773	88	11,088	7,936
Outer Reserved Area ..	IV	19,720	1,928	200,592	140,105
Extension Area ..	V	223,149	21,622	1,549,296	1,066,292
Country-side ..	VI	940,000	94,000	6,580,000	....
		1,183,642	117,638	8,340,976	1,214,333

The Indian Central Cotton Committee have granted substantial subsidies for this work, and it is due to this assistance that it has been possible to organize such large "Reserved Areas."

In the year under report (1930-31) these seed operations were hampered by the great slump in prices and the Societies could not distribute all the seed shown against VI in column 3 of the tables above.

In Khandesh a similar seed scheme has been launched in May 1931 for the distribution of Banilla cotton. This is mainly financed by the Indian Central Cotton Committee and when it reaches full development it will be the biggest seed scheme

hitherto organized by the Bombay Department of Agriculture. The following table summarizes the scale of operations at each stage :—

Stage Number	Where located	Character of work to be done
I	Dhulia Government Farm	500 lbs. of selfed seed is to be produced from 5 acres of cotton.
II	Multiplication plot of 200 acres to be rented on wilt-free land.	Seed multiplication on 100 acres of land sown with cotton.
III	A small group of villages in a suitable tract.	This will be the inner reserved area on which seed multiplication will be made on 1,000 acres.
IV	Groups of villages at five centres	These will be outer reserved areas on which seed multiplication will be made on 10,000 acres (i.e., 2,000 acres at each centre).
V	Five cotton zones in suitable tracts.	Further multiplication on five areas of 20,000 acres each.
VI	Whole of Khandesh	General cotton crop.

Banilla cotton is a hybrid having for its parents Bani and Commilla cottons and the principal characters of this cotton are summarized below ; and the launching of a Seed Scheme has been under consideration for some time but this cotton developed two defects—

(a) susceptibility to wilt disease

and

(b) decline in spinning performance.

While the Department has been hesitating to launch a seed scheme the public have taken matters into their own hands. Both the grower and the local trade are determined to have this cotton, with or without assistance ; and as a consequence the area under this cotton has run up to one lakh of acres in 1930, mostly as the result of natural spread.

The important factors to take into account are (a) the distribution-incidence of wilt in Khandesh and (b) the relative—

- (1) acreage yield,
- (2) ginning percentage,
- (3) spinning performance,
- (4) wilt susceptibility,
- (5) price, and
- (6) growers' profits

of this cotton and those of alternative cottons, such as the local desi and "N.R." cottons.

At the present time wilt is not widespread in Khandesh. It is confined to a limited area in East Khandesh. Out of a total cotton area of 13 lakhs of acres only $1\frac{1}{2}$ to 2 lakhs of acres of cotton fall within the wilt-zone. This is in East Khandesh while West Khandesh is reported to be quite free from wilt.

The following statement summarizes the results of village trials in 1929-30 with Banilla cotton and other cottons :—

BANILLA COTTON

Statement showing yield, ginning percentage, rate, value of acre-crop of Banilla, Local and N. R. Cottons, 1929-30

Serial No.	Place	BANILLA COTTON					LOCAL COTTON		
		Area in acres	Yield per acre in lbs.	Ginning percentage	Lint Rate per Boja	Rate in rupees for Seed-cotton, per Maund (42 seers)	Area in acres	Yield per acre in lbs.	Ginning percentage
1	Mamurabad	55	415	38.39	127 14 0	..	66	366	32
2	Asoda ..	29	475	40	127 14 0	..	22	410	38
3	Baver ..	375	256	38	.....	11 6	200	210	32

Serial No.	Place	LOCAL COTTON—contd.			N.R. COTTON *					VALUE OF ONE ACRE IN RS.		
		Lint Rate		Seed-cotton, Maunds	Area in acres	Yield per acre in lbs.	Ginning percentage	Lint Rate per Boja	Seed-Cotton, Mds.	Banilla	Local	N.R.
		Boja	Palla									
1	Mamurabad	109	..	..	40	470	35	110	..	52	38	46
2	Asoda ..	110	..	..	15	512	35	110	..	63	37	50
3	Baver ..	..	..	9 6	..	..	..	..	..	35	24	..

It will be seen from the above statement that—

(1) the acreage yield of Banilla compares very favourably with that of other cottons,

(2) the ginning percentage is 3 per cent. higher than that of the strain of N.R. with which it was compared and 4 to 5 per cent. higher than that of desi cotton,

(3) the premium per maund of 168 lbs. of kapas offered for impure Banilla, in the current year (1930-31), is Rs. 2 on a basis of Rs. 11, while for pure Banilla the premium offered runs from Rs. 3 to 4,

* This is ordinary. "N.R.," and not a selected strain therein.

(4) the extra profit per acre has been round about Rs. 10 over "N.R." cotton.

Turning now to wilt susceptibility, the latest figures for 1930-31, on the Jalgaon Farm, are—

Banilla	.. 35 per cent.
Local	.. 49 per cent.
"N.R."	.. 51 per cent.

It will thus be seen that although this cotton is highly susceptible to wilt, it is less so than the alternative cottons; hence a grower can ignore this factor when judging the merits of these three cottons. Moreover it should be remembered that, as pointed out above, wilt is not widespread in Khandesh. As regards spinning performance reference is invited to the reports of the Director, Technological Laboratory, Matunga. The latest report is dated 26th November 1930 from which it will be seen that although this cotton has recovered its length and fineness of previous years it has not recovered its strength. Hence for practical purposes this cotton has been adjudged suitable for standard warp counts up to 14's. This is much lower than was formerly expected of this cotton, but even 14's represent a substantial superiority over the 8's or 10's of "N.R." cotton. The general conclusion which seems justified from these data is that although Banilla cotton is not perfect, it is nevertheless a markedly superior cotton to any alternative immediately available cotton in Khandesh.

Accordingly it was considered important that the Department should organize a large seed scheme so as to prevent the reputation of this cotton becoming ruined through wholesale mixing, which would be inevitable in the absence of control measures. The yield of the crop in the year under report (1930-31) amounted to 30,000 bales. Of these about 3,500 bales were produced on an area (10,720 acres) which was controlled and purified by the Department, and most of this lot of bales was purchased by the local Khandesh Mills at a premium ranging from Rs. 10 to 20 per candy of 784 lbs. The seed from this purified area amounting to 500,000 lbs. constitutes the stock for distribution under the new seed scheme referred to above.

In Gujarat the cotton seed operations were continued on the lines described in previous reports, but the scale was expanded with the aid of a subsidy from the Indian Central Cotton Committee. The improved variety introduced into this tract is known by the registered number 1027 A.L.F.

The seed operations in the year under report are summarized in the following statement :—

Stage	Operation	Area in acres in 1930-31	Quantity of seed secured in lbs. in 1931
I	Selling	A small plot. Cotton Breeder's area—	155
II	Multiplication on Surat Station { A ..	23	1,017
III	B ..	54½	23,367
IV	Multiplication in seed growing villages	13,836	2,403,120
	Further Extension	239,160	Not secured as no control is kept.

Out of the 2,403,120 lbs. of seed stocked in the year under report 1,531,020 were supplied to the Indian States of Rajpipla and Chota Udepur; while 872,100 lbs. were distributed in British territory (though not all as seed) through 20 depôts located at suitable centres.

Rice.—Seed operations with rice are mainly located in the Konkan which has been divided for this purpose into three principal tracts as stated below—

- I. Thana and Kolaba tract,
- II. Ratnagiri tract,
- III. Kanara tract.

Each of these tracts is further divided into three zones representing the following types of rice :—

- A. Early,
- B. Intermediate,
- C. Late.

The new system of seed distribution introduced in 1928-29 consists in appointing ten registered seed-growers per taluka per season. These growers are changed from year to year. Improved seed is supplied to each registered seed-grower at half the market rates on the following conditions :—

- (1) The Department of Agriculture shall be permitted to rogue (i.e. purify) the crop, and
- (2) the seed-grower shall make the best half of the produce available as seed to his tenants, if any, and other growers at the market rate obtainable for it.

Thus in 1929-30 there were 61 registered seed-growers in the Thana and Kolaba tract and the area sown by them with improved strains was about 400 acres. This was carefully purified and the total produce amounted to about six lakhs of

lbs. of which half was sown in the year under report (1930-31) for sowing an area of 10,000 acres. In 1930-31 the Department again gave out about 20,000 lbs. of improved strains in this tract to its registered seed-growers for sowing an area of about 650 acres from which about $4\frac{1}{2}$ lakhs of lbs. of seed, sufficient for sowing 15,000 acres, has been distributed for sowing the 1931-32 crop, and in addition arrangements have been made to organize 75 registered seed-growers for 1931-32 to whom about 17,000 lbs. of seed is being supplied for sowing 550 acres.

In the Ratnagiri tract about 4,600 lbs. of seed of improved strains was supplied to seed-growers for sowing 60 acres in the year under report from which about 60,000 lbs. of seed was obtained, half of which has been distributed as seed to the general rice growing public for sowing in the season 1931-32. In addition, the Department has issued about 4,600 lbs. of seed, sufficient for sowing 75 acres of seed-growers' farms in 1931-32.

In the Kanara tract about 16,000 lbs. of seed was distributed.

Similar work on a smaller scale is in progress with wheat, groundnuts, jowar, bajri and nagli.

As regards wheat, some 41,000 lbs. of Pusa 4 seed was distributed in the Panch Mahals. In the case of Jowar 6,747 lbs. of "Budh Perio 53" seed has been distributed in the Surat area.

As regards oil-seeds, the Department has introduced Spanish peanuts and Japanese Small which now constitute the principal groundnut crop in Khandesh and the Panch Mahals and operations in seed are developing.

As regards Tobacco, the principal improved variety in Gujarat is "G. 6" but the cultivators preserve their own seed. The next most popular variety is "P. 28" of which 30 lbs. of seed were distributed in the year under report.

FRUIT STOCK

The Horticultural Section have rendered useful service in assisting the public to establish fruit orchards. Thus over 3,000 bor trees were budded in different districts, notably in Satara and Kolaba. In Khandesh one owner has as many as 800 improved bor trees as the result of the assistance of the Horticultural Staff.

In Khandesh 400 Dholka pomegranate plants were supplied to agriculturists in Nashirabad village of Jalgaon Taluka. The Taluka Association, Satara, distributed 10,000 Basrai

plantain suckers with the aid of the Department. In North Gujarat, 2,122 grafts were supplied, while in Broach District the number of fruit-stock distributed was 557, with limes predominating. There is a keen demand for advice on horticultural matters in the canal zone of the Deccan, and useful assistance has been rendered in teaching the people how to prune grape vines correctly. The area under fruit trees is increasing in this tract, and here every effort should be made to foster the fruit industry.

SEED GRADING

The advantages to be derived from the grading of seed, especially jowar seed, are becoming widely appreciated. This is a very simple operation which can be done by hand-sieves. In Barsi Taluka of Sholapur District 13 villages have adopted the method wholesale, and as a result of propaganda in Sholapur District 544,526 lbs. of jowar seed was graded, of which the Department directly graded about one-half. This is exclusive of the grading done by private persons and Co-operative Societies. The average increase in yield of the jowar crop, from graded seed, distributed over a large area, was 32 per cent. in the case of the grain and 15 per cent. in the case of the Kadbi. Again in the Gadag tract of the Dharwar District 48 sieves were sold in the year under report.

PREMIUM BULLS

There is a great demand for premium-bulls, especially those which are bred at Chharodi. The following table indicates the expansion of these operations in the seven intensive breeding zones referred to on the following page.

Name of breeding zone	Number of premium bulls			
	Working on 1st July 1930	Whose 3-year period expired in 1930-31	Issued in 1930-31	Working on 1st July 1931
Chharodi	23	5	12	30
Surat	3	1	7	9
Satpura	6	....	....	6
Nasik .. ..	....	....	....	....
Sholapur	5	3	9	11
Belgaum	1	....	2	3
Bankapur	11	1	9	19
Total ..	49	10	39	78

It will thus be seen that there were 78 premium bulls working in the Intensive Breeding Zones on the 1st July 1931 under the control of the Live Stock Expert.

In addition there were 14 premium bulls working in the rest of the Presidency under the control of the Deputy Directors of Agriculture.

It is satisfactory to record that there is a marked improvement in the quality of the stock in the villages provided with premium bulls, and what is equally important, the reputation of several of these villages for good cattle is increasing.

There has been some reconstitution of the Intensive Breeding Zones directly controlled by the Live Stock Expert since the statement printed on page 23 of the 1928-29 Report was prepared. Hence a statement corrected up to date is given below :—

Intensive Breeding Zones

Serial No.	Name of zone	Constitution of zone	Headquarters of zone	Name of breed
I	Chharodi	Virangam Sanand Prantij Dholka South Daskroi	Talukas ..	Chharodi .. Kankrej.
II	Surat	Olpad Chorasi Jalalpur	Talukas ..	.. Kankrej.
III	Satpura	Shirpur Shahada Sindkheda Nandurbar	Talukas ..	.. Tapti Khillari.
IV	Sholapur	Pandharpur Malsiras Sangola Man Vita	Talukas ..	Pandharpur .. M h a s w a d Khillari.
V	Nasik	Akola Igatpuri Shahapur Murbad	Talukas ..	.. Dangi.
VI	Belgaum	Athni Chikodi	Talukas ..	.. K r i s h n a Valley.
VII	Bankapur	Bankapur Karajgi Ranibennur Hangal Kod Kalghatgi	Talukas ..	Dharwar. .. Amrit Mahal.

POULTRY

The poultry industry, in the aggregate, represents a very important branch of agriculture in Bombay Presidency, and it is satisfactory to note that improvements are becoming visible. For example one can see cross-bred birds in almost all parts of the Presidency, but the most progressive centres appear to be

Rahuri in Ahmednagar District.

Tellur and Savandatti in Belgaum District.

Annegiri in Dharwar District.

Baramati in Poona District.

Sangli State.

The Department issued 82 stock-birds in the year under report, mostly in the Poona District. In the Sangli State Mr. L. K. Kirloskar has made excellent progress and has organized a weekly supply of eggs and poultry to Bombay market. He sends 800 eggs per week to Bombay and gets a price of 14 annas 9 pies per dozen. An important caterer in Poona has offered him 12 annas per lb. for capons. Bombay consumes about a lakh of eggs per day and it is understood that certain large consumers like confectioners are prepared to purchase by weight, hence there is a considerable incentive to raise the weight of the average egg to something approaching 2 ozs.

THE FODDER SUPPLY

As pointed out else-where in this report there is no more unsatisfactory feature of Indian Agriculture than the fodder supply of the cattle. There are scarcely any villages in the more heavily cultivated Jirayat tracts where the cattle are not semi-starved for a considerable period of the year. This is due partly to the agriculturists not balancing their cropping so as to provide a reasonable supply of cattle food and partly to the lack of care in conserving what material is available. This Department has been assisting the public to conserve the available fodder in the following ways.

Silages.—The Livestock Section has been demonstrating silage making at all its institutions namely Chharodi, Sangvi, Bankapur and Kandivlee, and it is satisfactory to record that these demonstrations are now bearing fruit. Several silo pits have been made by Co-operative Societies and by agriculturists in the neighbourhood of these places. During the year under report the staff of this section demonstrated silage

making and feeding at seven centres. During the year under report silage demonstrations were also conducted at the marginally noted centres in the Konkan by the staff of the Deputy Director. The silage was excellent in quality and was eaten by the cattle with great relish, and several agriculturists are reported to have decided to adopt silage making.

Chaff-cutting.—The Department recommends that jowar kadbi should be chaffed. In this way it can be fed to cattle more cleanly and with a minimum of waste. During the year under report a power-chaff-cutter was demonstrated at five centres in Jalgaon and Erandol talukas of East Khandesh, when 24,750 bundles of kadbi weighing approximately 2,98,000 lbs. were chaffed, and the hire charges realized were Rs. 30-15-0.

BORING FOR WATER

This valuable work has been temporarily suspended owing to the financial crisis, but it is hoped to resume operations on a smaller scale before long. The closing down orders took effect from the 31st October so that the operations of the year under report were for a limited period only which largely coincided with the monsoon season. In the year under report there were 12 boring machines working under the direct control of the Agricultural Engineer and 18 boring machines working under the five Presidency Deputy Directors of Agriculture. Altogether 68 bores were made resulting in the tapping of 10,767 gallons of water per hour. The total footage bored amounted to 5,025 feet. This Department has been conducting boring operations for 22 years and it may be of interest to tabulate some of the principal results in summary form :—

Number of feet bored	.. 215,113
Water supply tapped in gallons per hour.	3,147,044

WATER-FINDING

The Agricultural Chemist controls the work of four machines for locating under-ground water. During the major part of the working season of the year under report there was only one machine at work owing to retrenchment, and 115 sites were tested for the public. Up till now it is reported that on two of these sites wells have been dug and these have proved successful.

LAND-IMPROVEMENT

There are few things in Indian Agriculture which offer a better field for useful work by the Department of Agriculture than permanent improvements to the land. This is especially the case in an undulating country like the Deccan and Karnatak. Under such conditions a very large percentage of the annual rainfall runs off the fields into the nallahs carrying with it much fertile soil. Some interesting data have been accumulated with regard to these losses of water and soil which are referred to in another section of this Report, *vide* page 217. These losses can be very largely reduced by the construction of tals (embankments). Tal-making is a long-established custom but a careful study shows that the execution is very unscientific. Thus faulty alignments are taken and waste weirs are located at the wrong sites. The Department employs four officers, called Bunding Officers, for assisting the public to construct embankments on scientific lines. These Bunding Officers prepare small projects, with plans and estimates, for individuals and groups of individuals; and their services are in great demand, so much so that a large increase of staff could be very usefully employed. In the year under report in the Bijapur District alone projects were prepared for 35 schemes, located in 26 villages, estimated to cost Rs. 36,725. In the Belgaum and Dharwar districts, taken together, 22 projects, estimated to cost Rs. 16,700, were prepared.

In the North Central Division (Khandesh-Nasik) the Bunding Officer prepared 36 projects.

In the Deccan the Bunding Officer surveyed 28 projects fully and he had another 110 applications on his books to be dealt with in the future.

MECHANICS

Four out of the five Deputy Directors have on their staff a Mechanical Assistant whose duty is to deal with mechanical problems not demanding the personal attention of the Agricultural Engineer. They assist the public in selecting machinery and preparing plans and estimates for small power-plants and in the erection and inspection of these plants. This kind of assistance is much appreciated and the demand for such aid from the public has much increased.

The most important example of this type of work in the Deccan, in the year under report, was at Phaltan where an Irrigator (Mr. C. R. Dhakale) on the new Nira Right Bank Canal decided to erect a combined power-plant consisting of—

- (1) a battery of 8 cotton-gins,
- (2) a battery of 2 oil-mills, and
- (3) a sugarcane mill, together with
- (4) an Oil Engine to provide the power.

The engine selected on the advice of the Department was a 45 B.H.P. Blackstone "Spring Injection" cold starting, S.I. type engine. The gins were single-roller Macarthy and the oil-mills were the improved rotary Cooper, while the cane-mill was the No. 92 Chattanooga. With the exception of the cane-mill the whole of this machinery, together with shafting and a shed were erected by Mr. Peter Rahater, the Mechanical Assistant, South Central Division, at an inclusive cost of Rs. 17,500.

It sometimes happens that agriculturists erect their power-plants and then find that they do not work satisfactorily. In the year under report the Mechanical Assistant, South Central Division, had to deal with two such cases, and he accordingly re-erected the machinery, e.g. in Padegaon village (Nagar District) he re-erected a cane-crushing plant consisting of a 22 B.H.P. Imperial, Hot Starting, Crude Oil Engine and No. "92" Chattanooga Mill. Altogether this officer dealt with 40 applications for assistance, in the year under report, of which he found time to dispose of 18.

In the Karnatak the Mechanical Assistant prepared plans and estimates for 15 pumping-plants and 1 power cane-mill plant. The number of power-pumping plants is increasing especially in Bijapur District and the Mechanical Assistant continued to be fully employed.

CROP-PROTECTION

Fencing.—In the Mallad tract of the Southern Division the pig menace makes it very risky to grow certain types of crops such as groundnuts, and the value of fencing is now widely recognized. This generally requires co-operative action and hence fencing societies have to be organized. In the year under report such a society was registered at Arbhavi for the

purpose of erecting a wire fence some 7 miles long to protect 8,000 acres at a cost of Rs. 14,000. Similarly papers are being prepared for the registration of the Tegur Fencing Society. This latter scheme is planned on the basis of a complete enclosure to protect an area of 1,300 acres, much of which is valuable paddy land having a good water supply. In Mundagad division individual cultivators purchased and constructed $5\frac{1}{2}$ miles of fencing in the year under report.

The time has come when it is necessary to legislate in the common interest to compel apathetic absentee landlords to bear their share of the cost of joint-fencing schemes.

Pig-killing campaign.—A special pig-killing officer has been attached to the Deputy Director of Agriculture, South Central Division, for some years and his services have been much appreciated by the public, so much so that he had to be loaned to other divisions including Gujarat and Khandesh in the year under report. In the various campaigns organized during the year under report 142 pig, 29 deer and 30 Nilghai (blue bulls) (*Bosephalus tragocamelus*) were destroyed. The cost of killing a pig varied from Rs. 1-6-6 to Rs. 14-4-6, but this is misleading as it depends on the relative density of the pig population, whereas a more significant measure of the expenditure is the cost of protecting an acre of valuable crop. Tested by this measure the cost of protecting 2,500 acres of sugarcane on the Godavari Canal works out to less than 2 annas per acre even though it costs more than Rs. 14 to kill a pig. The total contingent cost of these campaigns, in the year under report, was Rs. 1,038-4-9, of which the public contributed Rs. 707-9-7 and Government gave a grant-in-aid of Rs. 330-11-2 in addition to the services of the officer. It is satisfactory to note that the agriculturists in certain villages in Koregaon Taluka of Satara District where the Pig-Killing Officer has worked for three years, organized their own campaign in the year under report when they killed 26 pig at an average cost of Rs. 2-8-0 per pig. Arrangements are being made to lend the services of the Pig-Killing Officer to the Central Provinces Department of Agriculture for one month to demonstrate how to organize pig-killing campaigns and to train some men.

Deer-killing campaigns.—In certain parts of this Presidency deer cause great havoc to standing crops, and the Taluka Development Associations of Ron and Gadag in the Dharwar District continued to fight this pest in the year under report under the Department's guidance. These operations were

conducted in three villages with the results indicated in the following tabular statement :—

Names of the villages	Name of the Taluka	Subscriptions collected	Expenses incurred	Number of deer killed	Area protected by the campaign
		Rs. a. p.	Rs. a. p.		
Mallapur ..	Ron ..	254 12 0	327 4 5	63	4,200
Koujageri ..	Ron ..	323 10 7	226 0 0	38	2,300
Balaganur ..	Gadag ..	130 6 0	147 7 0	45	6,000
Total ..		708 12 0	700 6 5	146	12,500

Anti-Jowar-Smut treatments.—The work of steeping or dusting jowar-seed as a preventive of smut disease was continued mainly through the Revenue Department and the Taluka Development Associations. Packets of copper sulphate and sulphur dust were distributed in the Karnatak, sufficient to treat seed for upwards of half a million acres. In the South Central Division in addition to distributing packets of copper sulphate and sulphur dust the officers directly treated some 3,000 lbs. of agriculturists' seed and returned it for sowing.

Mango-dusting.—With the aid of a grant from the Trustees of the Sir Sassoon David Trust a research scheme has been conducted at Ratnagiri in connection with mango blight and its prevention. This disease is caused by two agents namely jassid insects and downy mildew. A successful method of dusting the trees with fine sulphur powder has been worked out, which protects the crop, in large measure, from this disease. It is reported that every intelligent mango grower in the Ratnagiri District has now adopted this method and that 50 dust-guns are now working in this tract.

Betelnut-spraying.—The Supari palm suffers from a serious disease called "Koleroga", but it can be controlled by spraying. In all 278 Kanara garden-cultivators adopted this preventive treatment and an area of 800 acres in Kanara and 60 acres in Ratnagiri were sprayed in the year under report; and spraying material to the value of 3,500 was supplied by the Department.

Betel-vine protection.—A devastating wilt-disease broke out in the Bassein betel-vine gardens some 3 or 4 years ago, and the Department is carrying on an investigation into this disease and hopes soon to be in a position to recommend suitable

protective measures. The matter has become very urgent because this disease has now (October 1930) spread to Kelwa Mahim, a village in the West of Palghar Taluka, where the cultivation of this crop is of great local importance. In fact this village has been profiting as the result of the misfortunes of the Bassein people, and the area of betel vines has gone up from 60 to 100 acres. A characteristic of this disease is the rapidity with which it spreads; thus the average infection in August 1931 has risen to 70 per cent. in the central portion of the garden tract, while many wadis (plots) are attacked to the extent of 100 per cent. No crop requires a greater expenditure per unit of area or brings in a greater gross profit than betel vines; and the leaves from this tract are exported daily to distant markets in the north of India and elsewhere.

Safeguarding the potato crop.—This crop is subject to the attacks of several insect pests. One of the most serious is known as the potato moth. This pest can be controlled by fumigating the seed before planting, and it is satisfactory to record that 10 Belgaum potato growers have built their own fumigation pits while the Khed (Poona District) potato growers fumigated 18,000 lbs. of seed. In this latter tract 25 acres of potatoes were sprayed by cultivators to prevent the tamera disease while at Belgaum most of the potato-growers have taken to spraying the crop as a protection against the jassid insect. The precautions of fumigating the seed and spraying the crop at Belgaum are estimated to save the potato-growers about a lakh of rupees annually, and these people have now dropped the idea of abandoning potato cultivation owing to the risks from these pests.

Other crops.—Spraying or dusting was also adopted in the case of grapes by the Nasik grape-growers and figs by the Saswad fig-growers.

MARKETING PRODUCE

Regulated Cotton Markets.—The first Regulated Cotton Market, under the Bombay Cotton Markets Act, 1927, was organized at Dhulia in the year under report.

The object of this Act is to remove the many abuses which are associated with the cotton markets of this Presidency, especially secret sales, false weighments, arbitrary allowances and deductions for alleged defects, etc., etc.

After the passing of the Act the first task which had to be undertaken was the preparation of the Rules under the Act.

This gave the Department a considerable amount of work but it received assistance from the Indian Central Cotton Committee. The Rules were finally approved by the Legislative Council in September 1929.

The second step which had to be undertaken was the education of public opinion. As time elapsed it became clear that Khandesh offered the most suitable cotton tract in which to launch the first Regulated Cotton Market, and finally Dhulia was selected, after much preliminary work by the Revenue and Agricultural Departments.

Accordingly the first regulated cotton market in the Bombay Presidency was brought into existence at Dhulia in the year under report, and as a result of the goodwill of the Dhulia Cotton Merchants it was possible to give this new type of market an excellent start. Although this market did not come into operation till 1st December 1930 the business conducted was satisfactory as may be gauged from the following figures for the period ending 23rd May 1931 :—

Number of carts arrived in the market			Fees collected in rupees					Disputes settled	
Seed cotton	Clean cotton	Cotton waste	Licenses to brokers, weighmen etc.	Seed cotton	Clean cotton	Cotton waste	Total	By Superintendent of market	By Sub-Committee
32,522	1,296	96	2,145	4,065	486	12	6,708	167	9

It is hoped to establish a second regulated market at Amalner in the coming year 1931-32.

Grading Cotton.—The Department assists the Hubli and Gadag Co-operative Cotton Sale Societies to grade their produce according to ginning percentage. The superior ginning grades of cotton secure substantially higher prices, e.g. the top grade "Jayawant" cotton with a ginning percentage of 29 secured a price of Rs. 147 per "Naga" (1,344 lbs.) when the price of ordinary Bazar cotton (mixture of Kumpta and Dharwar No. 1 cottons) was Rs. 130 to 135; and similarly the top grade "Gadag I" cotton with a ginning percentage of 34 secured a price of Rs. 168 per Naga against Rs. 140 to 144 for ordinary Dharwar-American cotton (mixture of Dharwar-American and Upland).

Grading Fruit.—Fruit is marketed by the grower or up-country dealer in a very primitive manner in this Presidency.

The art of grading is almost unknown. The Department has been demonstrating at Ratnagiri the method of grading mangoes and the correct packing thereof. In the year under report about 2,000 baskets of mangoes were graded by merchants with the aid of two Departmental officers at Vengurla, Malvan and Ratnagiri. In the early part of the season (i.e. the latter part of April 1931) there was an additional profit of Rs. 5-12-0 per hundred on graded over non-graded mangoes.

Exploring new markets for produce.—A research scheme is under consideration with a view to solving the incidental problems underlying the establishment of a successful export trade in fresh fruit (mangoes). It is believed that there is an opening for such fruit on the important Western Markets such as London and Paris.

Another possible opening for mango marketing has arisen in connection with medical science. It has been ascertained that mangoes are a source of some of the most valuable vitamins, and as explained on page 47 of this Report, this Department is co-operating with the Lister Institute of Preventive Medicine, London, in the further investigation of this matter.

Cashew Nuts.—Attention has been directed to the American Market for Cashew Nuts, which is rapidly expanding as may be gauged from the following export figures to the United States of America extracted from "Commerce Reports" dated 25th May 1931 :—

*Exports of Cashew Nuts (shelled) to the United States
from Haiti and South India*

Country of origin	Pounds	Value	Country of origin	Pounds	Value
		\$			\$
South India—			Haiti—		
1930 ..	3,978,098	8,92,706	1929-30 ..	122,011	16,013
1929 ..	3,202,715	7,54,348	1928-29 ..	214,933	26,954
1928 ..	2,810,073	6,87,200	1927-28 ..	136,277	24,707
1927 ..	2,241,668	5,38,010	1926-27 ..	321,620	54,690
1926 ..	833,722	1,80,343	..	..	..
1925 ..	398,627	73,226	..	..	..

The following import figures into the United States of America provide further striking evidence of this trade development. It should be noted that the United States of America imports shelled nuts only :—

Imports of Cashew Nuts (shelled) into the United States of America for consumption

Year	Quantity in lbs.	Value in dollars
1929	4,074,689	9,70,283
1930	6,938,033	14,90,344

It is clear from the figures given above that South India is the principal source of supply. Hitherto the United States of America did not separately classify cashew nuts in her import statistics, but since June 18, 1930, cashew nut imports were set up as a separate item in the general import tabulations which also show the countries of origin ; and the imports during the nine months from 18th June 1930 to 31st March 1931 totalled 51,96,352 lbs. valued at \$10,94,758 as shown in the margin.

It appears that India's exports are not wholly Indian produce. The Portuguese East African Colony of Mozambique produces relatively large quantities of these nuts, of which almost the entire output is exported in the unshelled form to India for shelling. Statistics show that exports of unshelled nuts from Mozambique to India are rapidly increasing, *pari passu*, with exports of shelled nuts from India to the United States of America as may be seen from the following figures :—

Cashew Nut (unshelled) exports from Mozambique

Year	Pounds	Year	Pounds
1929 ..	10,727,500	1924 ..	540,100
1928 ..	8,862,500	1923 ..	4,400
1927 ..	5,317,500	1922 ..	1,075,800
1926 ..	3,611,100	1921 ..	1,441,800
1925 ..	3,399,500		

The whole of India's exports of shelled nuts do not go to the United States of America ; but there are apparently no statistics for exports to other countries.

America uses these nuts principally in the salted nut trade and in the manufacture of confectionery.

This Department has recently supplied appropriate information about cashew nut production in the Bombay-Konkan

to the American Vice-Consul in Bombay who proposes to publish this information in the American Commercial Press.

MISCELLANEOUS SERVICES

Chemical Analysis.—The Agricultural Chemist's Section analysed 465 samples for the public, in addition to 691 samples received from Government Departments. The materials analysed consisted of waters, soils, fertilizers, feeding-stuffs, oil-seeds, milk and milk-products.

Takavi Loans.—In connection with the tractor ploughing operations of Messrs. Burmah Shell and Company in the Dharwar District the Department of Agriculture recommended to Government the grant of takavi loans to agriculturists, amounting to Rs. 6,760. The money passes direct from the Treasury to the Firm on the certificate of the Department so that there is no possibility of the money not being spent on the object for which it is granted.

In the Deccan the Revenue Department submitted a large number of takavi applications for constructing field embankments to this Department for advice and the Deputy Director of Agriculture, South Central Division, disposed of 16 and had in hand another 18 applications in the year under report. Similar work was undertaken by the Deputy Director of Agriculture, Southern Division.

Supply of Agricultural Requisites.—Owing to the activities of the Co-operative Department and certain business firms it has been found that the maintenance of Departmental depôts is not, now, so necessary as was the case formerly. In the Deccan in the year under report the total hire realized for ploughs, ridgers and cane-mills, from 24 depôts, amounted to Rs. 1,137; while in the North Central Division (Khandesh-Nasik) the hire revenue amounted to Rs. 741 from 10 implement depôts. In Gujarat implements worth Rs. 4,512 were distributed, consisting chiefly of Malwa ploughs, Persian wheels and wheat threshers. In North Gujarat, chiefly Kaira District, 127 tons of fertilizers were distributed. In Gujarat 200 packets of white arsenic and 213 packets of strychnine hydrochloride were distributed for rat destruction. The distribution of copper sulphate and sulphur powder has already been referred to.

Concessions for Agriculturists.—The question of railway freight on agricultural produce and requisites is always with us, and it is gratifying to be able to announce that Rao Saheb B. P. Vagholkar, Deputy Director of Agriculture, South Central

Division, Poona, has been nominated by Government as a member of the Local Advisory Committee of the G.I.P. Railway, and the first question to which he is devoting his attention is the freight upon bulky organic manures. Similarly Mr. S. S. Salimath, Deputy Director of Agriculture, Southern Division, Dharwar, has been nominated by Government as a member of the Branch Advisory Committee of the M.&S.M. Railway.

In the past the Department has been instrumental in securing the following freight concessions :—

FREIGHTS FOR MANURES OTHER THAN OIL CAKES

B.B. & C.I. Railway

Distances in miles			Rates in annas and pies per maund in force		Remarks
			Before 1st July 1922	Sanctioned subsequent to 1st July 1922	
25	..	..	0 1 3	0 0 10	Subject to a minimum charge of Rs. 20 per 4-wheeled B. G. wagon.
50	..	..	0 2 5	0 1 5	
75	..	..	0 3 1	0 2 1	
100	..	..	0 3 9	0 2 5	
150	..	..	0 5 2	0 3 1	
200	..	..	0 6 7	0 3 10	

FREIGHTS FOR OIL CAKES

B.B. & C.I. Railway

Distances in miles			Rates in annas and pies per maund in force		Remarks
			Before 1st October 1925	Sanctioned subsequent to 1st October 1925	
50	..	..	0 2 5	0 1 5	
75	..	..	0 3 1	0 2 1	
100	..	..	0 3 9	0 2 5	
150	..	..	0 5 2	0 3 1	
200	..	..	0 6 7	0 3 10	
250	..	..	0 7 11	0 4 6	
300	..	..	0 9 4	0 5 3	
350	..	..	0 10 2	0 5 11	
400	..	..	0 11 0	0 6 8	
450	..	..	0 11 10	0 7 1	
500	..	..	0 12 8	0 7 6	

FREIGHTS FOR ALL MANURES

G.I.P. Railway

Distances in miles	Rates in pies per maund in force		Sanctioned subsequent to 1928
	In wagon loads prior to 1st June 1928	In small consignments prior to 1st October 1928	
100	20	333	} 10 for any distance.
150	37	380	
200	37	713	
250	71	713	
500	71	913	
700	81	1,043	
Above 700 ..	81	1,143	

Among concessions obtained for Irrigators in the Deccan Canals tract special mention should be made of the facilities for green-manuring. If sann hemp is grown in the monsoon season the water will be given free while if it is sown between the 25th of May and the 15th June there will be a charge of only Rs. 2 per acre.

The Growers of Cocoanuts are enjoying the benefits of being placed in a position to secure salt at a concession rate of 8 annas per maund after it has been denatured by the Salt Department, for manurial purposes. In the year under report permits were issued for 3,364 maunds in the Konkan and 389 maunds in Gujarat.

Anti-famine Measures.—Apart from embanking, well-boring and water-finding the chief operation under this heading is the storage of fodder for use in times of famine or severe scarcity. The Department maintains a store of 10 lakhs* of lbs. of grass at Chharodi in Ahmedabad District with the aid of a subvention from the Sir Sassoon David Fund Trustees; and at Karajgi in Dharwar District the Department maintains a Jowar-kadbi shredding and baling plant. At present there are some 44,00,000 lbs. of fodder in this store and operations have, for the time being, been suspended.

* At present the quantity in store is only 3 lakhs of lbs.

CHAPTER IV

AGRICULTURAL RESEARCH

As a result of the recommendations in the Report of the Royal Commission on Agriculture in India and the existence of financing Bodies like the Sir Sassoon David Trust, the Indian Central Cotton Committee and the Imperial Council of Agricultural Research, public attention has been directed towards the fundamental importance of agricultural research as the basis for the advancement of Agriculture in this country. In this atmosphere it has been found comparatively easy for the Bombay Department of Agriculture to promote several important Research Schemes. These include—

- I—The Sugarcane Research Scheme for the Bombay Deccan (including Rotation Crops),
- II—The Dry Farming Research Scheme for the Bombay Deccan,
- III—The Virus Diseases Research Scheme,
- IV—The Surat Cotton Entomological Research Scheme,
- V—The Dharwar Cotton-Wilt Research Scheme,
- VI—The Surat Cotton-Physiological Research Scheme,
- VII—The Khandesh Cotton-Breeding Scheme,
- VIII—The Bajri-Research Scheme,
- IX—The Castor-Research Scheme,
- X—The Improvement of Grazing Lands Research Scheme, and
- XI—The Mango-blight Research Scheme,

not to mention numerous schemes financed by Government.

Most of these Research Schemes have been in operation for some years but the three first mentioned have not yet been launched. The Sugar and Virus Schemes have been sanctioned while the Dry-farming Scheme which has been recommended by the Advisory Board of the Imperial Council of Agricultural Research, awaits sanction.

SUGARCANE

It is probable that the Sugarcane Research Scheme will be launched in the near future and that the site will be near Lonand on the Nira Right Bank Canal. This is a big scheme having for its main objective the production of cane at a much lower price than has hitherto been prevailing so as to render

it possible for Peninsular India to produce sugar for the Indian market in competition with the North of India, and ultimately in competition with foreign cane-sugar producing countries like Java. It is hoped to achieve this goal by producing a more thrifty cane than the existing Pundia, which will require less manure and which will occupy the land for a shorter period of time, than Pundia, not longer than say 12 months. Some progress has already been made in this direction at the Manjri Experimental Farm, where the cost of cane has been brought down to 8 annas per maund of 80 lbs., but for various reasons it is proposed to absorb these operations in the new scheme. The Tariff Board consider that cane should be produced at annas 4 to annas 5 per maund if India is ultimately to hold its own against world competition.

DRY-FARMING

A large part of the Central portion of Peninsular India, spreading over zones of Bombay Presidency, Hyderabad State and Madras Presidency, receives a deficient rainfall and is constantly undergoing the ravages of famine or scarcity. Within relatively small limits canal irrigation is possible, but this is not so over the bulk of the country; hence the importance of evolving ways and means for the better utilization of the rainfall. A small research scheme which has been running for a few years, shows that much can be done in this direction. The scheme now under consideration contemplates putting the investigation of this immensely important problem upon an adequate footing at a centre to be selected in Sholapur District.

VIRUS DISEASES

For some years past certain crops have been found attacked by a devastating disease or group of diseases of a very obscure character. Notably among these crops are sugarcane, tobacco and chillies. A similar phenomenon has been happening in other countries, and it has been ascertained that the causal organisms of these diseases belong to the Virus class (these are so small that they can pass through a filter and remain unseen under a strong microscope), but research thereon is still in a very early phase in most countries, while in India there has been practically no research. The scheme which has recently been sanctioned will be financed by the Imperial Council of Agricultural Research and conducted at Poona by this department.

COTTON BOLLWORM

This research has now been completed. It was conducted at Surat by this department with funds provided by the Indian Central Cotton Committee. It has been ascertained that the spotted bollworm cannot exist in the absence of living cotton plants and certain other plants. It is, therefore, believed that the pest can be eliminated by destroying all such plants during the off-season; and the Indian Central Cotton Committee have given an additional grant for conducting preliminary propaganda over a tract exceeding 500 square miles in Broach District to teach the people the action which is necessary to take.

COTTON-WILT

This research scheme has been conducted at Dharwar where the disease has reached alarming virility, and it has been ascertained that the most effective measure that can be taken is to evolve strains of cotton which are resistant to the disease. Work on these lines has been very successful at Dharwar where Jayawant cotton has been bred; and there is a proposal to adopt similar procedure in Middle Gujarat and Khandesh where wilt is a serious cotton pest.

COTTON PHYSIOLOGY

This research scheme was planned with the object of discovering measures which would reduce the excessive shedding of the cotton flowers. Hitherto not much success in this direction has attended our efforts, but incidentally we have added greatly to our knowledge of the cotton plant, particularly as regards the physiology of the plant. Hence the return from this scheme will take the form of an addition to our fundamental knowledge by giving us a fairly complete picture of the life-history and behaviour of the cotton plant. This information is of the greatest importance, and may be of use in many unforeseen ways for it is these additions to knowledge which so often pave the way to great practical advances, e.g. wireless telegraphy followed a discovery in pure physics.

CROP-BREEDING

Cotton.—This operation is in progress at five centres, namely, Surat, Broach, Viramgam, Dhulia and Dharwar. The two best cottons so far evolved at Surat are known by the registered numbers of "1027 A.L.F." and "1A". A promising hybrid

cotton known as "Surat 5¹" was also mentioned in last year's report but the yarn spun from the fibre of this cotton has been adjudged as weak in the latest report of the Indian Central Cotton Committee's Technological Laboratory at Matunga (*vide* Spinning Test Report No. 210, dated 5th May 1931). This weakness was confirmed by the Tata Mills, Bombay, where a sample bale was forwarded for opinion. This is unfortunate because, as regards measured fibre-properties, this cotton is second to none, not even 1027 A.L.F.

In the year under report the question has been raised : Which is the best of the improved cottons evolved on the Surat Experimental Station for South Gujarat? In 1925 Government after reviewing the advice of the then Director of Agriculture and the Indian Central Cotton Committee decided that Hybrid No. 1027 A.L.F. should be the cotton officially approved for this tract. The reasons for this decision are fully explained in the accompaniment to Government Resolution No. 3798/24, dated 12th January 1926, Revenue Department, in which it is stated that of the two best improved cottons at Surat—

- (1) "1027 A.L.F.'s" field-performance (i.e. yield of seed-cotton per acre) was substantially the same as that of "1A".
- (2) "1027 A.L.F.'s" gin-performance was 3.0 per cent. below that of "1A" and
- (3) "1027 A.L.F.'s" fibre-performance (i.e. value of the clean cotton) was Rs. 582* per khandy.
- (4) "1027 A.L.F.'s" gross profit-performance (Rs. 102-3-0) was Rs. 4-1-0 per acre worse than that of "1A".

It was, however, argued that the reports upon the fibre of 1027 A.L.F. were so satisfactory that this cotton had the entry of Liverpool market whereas "1A" had no such second market and that it would only be a matter of time till 1027 A.L.F. cotton commanded a premium which would make its gross profit per acre higher than that of "1A". This anticipated enhanced premium has not materialized and the issue was brought to a head in November 1930 when Dr. Turner, Director of the Technological Laboratory of the Indian Central

* Average price for this cotton at Surat from 1920 to 1925 as reported on page 6 of the Government Resolution No. 3798/24 of 12th January 1926, Revenue Department.

Cotton Committee, submitted a report dated 24th November 1930 from which the following extract is taken :—

“ the differences in highest standard warp counts are not very large, the 1027 A.L.F. spinning some 4 standard warp counts finer than the 1A, say 34's as against 30's, though it should be noted that the average of the highest standard warp counts of the 1027 A.L.F. over the seven seasons 1923-1930 is only 31's. The average difference in the Grader's valuation is only 3·3 per cent., and this probably represents accurately the difference in the cottons as denoted by the difference in the highest standard warp counts to which they may be spun.”

The Indian Central Cotton Committee was consulted as to the interpretation which the Bombay Department of Agriculture should place upon Dr. Turner's report, and on the advice of the Committee certain mill tests were arranged which, however, when placed before the July 1931 half-yearly meeting of the Committee were deemed to be inadequate, and accordingly the Committee passed the following resolution :—

“ I. That the case be sent back to the Director of Agriculture, Bombay, with the request that he will lay down comparative experimental plots of 1027 A.L.F. and 1A cottons on—

- (a) experimental farms,
- (b) the lands of representative holdings of ordinary cultivators scattered throughout the area under consideration,
- (c) that notes of purity of the type, size and shape of the plots, repetitions and other data which will help in the interpretation of the results be noted,
- (d) this experiment to be carried out for two years and reported on to this Committee along with the spinning tests of fibre from the experimental plots and with the results of past tests.

II. That he will collect information to show whether in the region in question there are—

- (a) differences in quality of soil,
- (b) differences in methods of cultivation, or
- (c) other factors which are sufficient to cause difference in price of the fibre such as those shown in columns 2 and 4 of Statement III.*

* “ Not printed here, but appearing in the note of the Director of Agriculture, Poona, printed on page 29 of the Abstract Proceedings of the 23rd meeting of the Indian Central Cotton Committee held on 13th and 14th July 1931.”

III. That the Ahmedabad and Bombay Millowners be requested to submit their views on this subject to the Indian Central Cotton Committee."

As a matter of fact this resolution goes further than necessary because neither the field-performance nor the gin-performance, as stated in Government Resolution No. 3798/24, dated 12th January 1926, Revenue Department, as reproduced above, have been challenged, as relatively too low; and hence the only point at issue is the fibre-performance. Hence all that is really necessary is to decide once and for all with the aid of mill-tests what is the intrinsic superiority of the fibre of "1027 A.L.F." over that of "1A" cotton. If these tests confirm Dr. Turner's valuation then the conclusion will have to be drawn that "1A" is a more profitable grower's cotton than "1027 A.L.F." cotton.

At Broach the Department has a small sub-station under the control of the Surat Cotton Breeder. Here the object is to produce a cotton with an improved fibre, without sacrificing the high ginning character associated with the locality. In this tract cotton-wilt disease is a factor to be reckoned with and hence wilt-resistance is an essential character in any improved cotton for this tract.

At Viramgam the most promising cotton so far evolved is known as "Wagad 8". This is a straight selection from local Wagad. In the year under report this cotton yielded at the rate of 15 per cent. higher than local, while its ginning percentage was 3.1 per cent. higher and the spinning character is about the same as that of local cotton.

At Dharwar the breeding of wilt-resistant types continued to receive the major attention of the Cotton Breeder. "Jayawant" cotton retains the position of the best all round cotton so far produced. It has a fibre of equal quality to "Dharwar No. 1" and is superior to the latter in all other respects and it is wilt-resistant. Efforts are now being made to increase the ginning percentage and improve the colour of Jayawant cotton by hybridization; these are the two most conspicuous defects in the Kumpta group of cottons. The hybrid between "Kumpta W.R." and "Tashkant" has been found to possess fine fibre and will be carefully watched.

At Dhulia the best cotton so far evolved is Banilla, but its spinning capacity has not maintained its early promise when the tests showed that it was suitable for 19's to 21's counts.

This dropped to 15's counts in 1929-30, and the report of the Matunga Technological Laboratory upon the crop of the year under report again gives the counts at 15's and the valuation of Rs. 25 to 30 "on" Oomra Fine (fair staple). This cotton has a ginning percentage of 39. In addition to Banilla there are certain other strains having the same origin, of which "No. BXXI" is the most conspicuous. This is a good spinning cotton having been adjudged by the Matunga Technological Laboratory to be fit for 29's in the year under report. This cotton however is not wilt-resistant and its ginning percentage is only 37 per cent.

Selection of high ginning strains of Roseum cotton is being continued, because this cotton has no rival, apart from Banilla, as a profitable cotton to the grower. The two strains "U. 19" and "N.R. 144" are promising while a new selection from Berar Roseum has given a ginning percentage of 42 to 43 per cent.

In future wilt-resistance will be made the basic objective of all cotton breeding in Khandesh; and a scheme planned on these lines has been placed before the Indian Central Cotton Committee for consideration with a view to it being financed by that Body, if approved.

An important addition to our cotton-breeding staff has been the provision of two Cotton-fibre Technologists at the cost of the Indian Central Cotton Committee. We have had one at Dharwar for a couple of years and the Indian Central Cotton Committee have now kindly provided one for Surat. These officers render great services to the breeders by making a critical examination of the fibre of improved strains of cotton when the latter are in quite an early phase of development.

Rice.—Work is in progress at four centres, namely Karjat, Ratnagiri, Kumpta and Mugad. The most important breeding station, however, is Karjat in Kolaba District, where the Crop Botanist to the Government of Bombay now has his headquarters.

At Karjat the two best "late" strains so far evolved are "K. 42" and "K. 266," while among the early strains "K. 401" (early-intermediate) continued to do well and gave a slightly higher yield than the established strains "K. 79" and "K. 184". In the Bhadas variety the strain "B. 225" has beaten strain "B. 52" but the replication trials will be continued.

At Kumpta in the Jaddu variety the strain "No. 1061" has continued to yield better than the local rice; while in the

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Maskati variety the strain "No. 1315" appears to be the best. These are both early varieties of rice. In the Somsal variety the strain "No. 1650" has given an increased yield of 32 per cent. over the local Somsal in a trial containing six replications. This rice is suitable for the Siddapur Taluka. In future work will be concentrated mainly on the four varieties Maskati, Halga, Somsal and Dasar-patta.

At Mugad (Dharwar District) the promising strains mentioned on page 11 of last year's Annual Report have again done well in the year under report and have yielded from 13 to 25 per cent. more than local in carefully replicated trials.

At Ratnagiri in the Patani variety the strain "No. 6" again did well, yielding 15 per cent. more than the local Patani in a replication test. Similarly in the Kudai variety the white grained strain "No. 25" gave an increased yield of 16½ per cent. over the check in a replication trial. The strain "No. Ku. 42" has also done well, but it has red grain and is not liked by the growers. Among the intermediate strains "Panvel 61" was compared with the local Waksal in a replication trial and gave a 14½ per cent. increase in yield. This strain is much appreciated in the Dapoli, Chiplun and Ratnagiri talukas. Among the Waksal selections "strain No. 207" has done best yielding 20 per cent. more grain than local Waksal at Sakharpa sub-station.

Wheat.—The most important wheat tract in the Bombay Presidency is Nasik-Khandesh. In fact about 25 per cent. of the entire Presidency wheat crop is located in the Nasik District. Hitherto wheat-breeding operations have been located at Poona owing to lack of facilities elsewhere, but it is hoped to transfer the work to Niphad (Nasik District) in the near future, because the conditions at Poona are not very favourable for evolving a wheat suited to the aforementioned tract. Work has been mainly confined to the Bansi variety. The two most promising strains appear to be 806 and 809; and District trials carried out in the year under report indicate that strain "No. 809" will prove suitable in Nasik and Nagar Districts. The grain of this wheat is lustrous and the yield is high, and moreover it is relatively rust resistant. "Strain 103" has not lived up to its promise and will be superseded by, for example, strain "809".

Strains 162 and 168 appear to be suitable for West Khandesh while strain 224 appears to be suitable for East Khandesh, and it has been decided to multiply the seed of 168 and 224 for distribution. Similarly it appears that strain 224 should be

adopted as the standard wheat for the Bhal tract of North Gujarat where its characters of earliness and high grain-quality are appreciated. One grower has already produced 30,000 lbs. of pure seed of this strain, which is being distributed.

Considerable hybridization work is in progress, using Bansi as one of the parents.

Tobacco.—At Nadiad in a comparative trial containing five replications "G. 6" strain proved the highest yielder in the Gandiu class; while in the Piliu class "P. 45" and "P. 28" gave "significantly" higher outturns than local Piliu. Several fresh selections from both Gandiu and Piliu have been made, while certain hybrids are also under selection.

Other Crops.—Breeding operations are also in progress on Jowar, Bajri, Castors and Groundnuts. At Surat the work pertains to kharif jowar and the best strain so far evolved is "Budh Perio No. 53". This strain has yielded 19 per cent. more grain than local jowar on the average of the last five years.

At Mohol in Sholapur District work is in progress on rabi jowar which is the great staple crop of the East Deccan, covering several million acres. The work on Bajri at Poona indicates that this centre is not suitable for producing bajris intended to be grown in the principal bajri zones such as the North Deccan and North Gujarat; and hence it is proposed to locate work on the Deccan crop at Niphad (Nasik District) where the Department has suitable land.

As regards castors the work was commenced in Poona but transferred to Prantij (North Gujarat) where the crop is largely grown. This research has been steadily pursued on a definite plan, namely to select out of varieties, suitable commercially as regards shape and size, strains with high oil content. Nine such strains have been isolated and their performances are satisfactorily consistently high. It is hoped that we shall soon have one improved strain for the rabi crop and one for the kharif crop.

At Dharwar the improved "strain No. 5" in Spanish peanut has been evolved.

Fruit

The principal fruits receiving attention at the Ganeshkhind Botanical Gardens include :—

Mangoes.
Guavas.
Grapes.

Bananas.
Bors.
Jambul.

In the Guava class good results are being obtained with selected strains of the Lucknow, Nasik and Hyderabad varieties.

Much attention is being devoted to the problems connected with the preparation of fruit products and the Horticulturist to Government has been awarded a scholarship by the Empire Marketing Board to prepare himself to carry out a research scheme in the technique required in the export of fresh fruit (mangoes) from India to Overseas Markets. During the year under report the preservation of Jambul juice (*Eugenia Jambolana*) received special attention. This juice is believed to have highly anti-diabetic properties. Experiments show that this juice should be pasteurized at 70° C. for 30 minutes. Tomato juice has been found to keep well in bottles preserving the odour and flavour of the fresh fruit. Salting at the rate of one per cent. secured a clear golden colour. Medical science indicates that the mango is a good source of vitamins (particularly the anti-scorbutic vitamin C) and at the request of Dr. S. S. Zilva of the Lister Institute of Preventive Medicine,

Alphonso.
Shendra.
Cowasji-Patel.

Chelsea, London, a weekly consignment of three dozen fruits of the marginally noted varieties has been despatched

for a period of a month. These fruits were shipped in the Purser's cool room of the P. & O. Mail Steamers where the temperature ranges from 40 to 45° F. and the fruits reached London in good green condition.

CATTLE-BREEDING

The production of premium-bulls is being carried on at four principal centres—

Chharodi in Ahmedabad District.

Surat in Surat District.

Bankapur in Dharwar District.

Kandivlee in Thana District.

At Chharodi and Surat the breed is Kankrej ; and excellent bulls are being produced. The best cow (Ravti) at Chharodi yielded over 5,000 lbs. of milk in 279 days while two others exceeded 4,500 lbs. Hence the young bulls serve a dual purpose (1) improving the draught animal and (2) improving the milk-yield. Altogether 29 bull-calves and 35 female calves were produced at Chharodi in the year under report and 11 bulls were issued under the premium system. It may be of

interest to mention that since the War 578 bull-calves have been produced at this institution, of which 135 have been issued as premium bulls.

At Bankapur the breed is Amrit Mahal and the strength of the herd is about 150 head of stock. Considerable improvement as regards regularity of annual calving and as regards earlier maturing, is being achieved. During the year under report there were 35 births, and the average weight of the calves at birth was 43 lbs. which is satisfactory. Progress is also being made in the art of rearing young bulls. If herded together they waste themselves. During the year under report 12 loose-boxes 12'×15' each having a run of 50'×12' have been erected and it has been found that the young bulls are thriving much better when separated than when tied together in a common byre. This herd is now becoming much purer as may be judged by the colour and markings of the stock; and the light coloured animal is now becoming the standard type.

Action is also being taken to provide Chharodi Farm with a number of separate bull rearing pens.

The work at Kandivlee is done in co-operation with the Bombay Gowrakshak Mandali. Here the breed is the Gir and the Department subsidizes (to the extent of Rs. 2,400 per annum) the work on condition that the young male stock are made available as premium-bulls. One cow (Vanganga) yielded 5,121 lbs. of milk in the year under report, but the lactation period was 452 days. Another cow (Draupadi) yielded over 5,000 lbs. of milk within 400 days, while several cows touched 4,000 lbs. of milk.

In addition to the four institutions mentioned above, the Department has two small cattle breeding farms at Sangvi for the Tapti-Khillari breed in West Khandesh and Tegur in Dharwar District for grading up the Malad cattle. The former institution issued three premium bulls in the year under report.

CATTLE NUTRITION

The subject of animal nutrition is now-a-days receiving more attention in India than it did in the past, and the work at Bangalore, apart from the work at the Rowlett Institute in Aberdeen, is attracting much attention. The Bombay Presidency Department of Agriculture is not well-equipped for this class of Research except in raw material, but plans are under consideration for undertaking comparatively simple

investigations with the assistance of Dr. Warth of the Imperial Institute of Animal Husbandry, Bangalore. The immediate proposal is that the problem of feeding minerals to cattle should be taken up because this is a very promising investigation which is not as straight forward as is sometimes assumed.

PLANT-DISEASES

Reference has already been made to the virus diseases of plants and to cotton-wilt. Recent advances in the control of plant diseases in this Presidency include :—

I. The Sulphur treatment for preventing the following diseases :

- (a) Smut of Jowar.
- (b) Blight of Mangoes.
- (c) Powdery mildew of Grape Vines.
- (d) Powdery mildew of Jiru. (*Cuminum* sp.)
- (e) Powdery Mildew of Peas.
- (f) Rust of Figs.
- (g) Red-leaf-blight of American cotton.

II. The Coal-tar creosote treatment for controlling gummosis in citrus trees, and

III. The Bordeaux-mixture treatment for controlling betel-vine wilt. (*Phytophthora* sp.)

An important defect in the treatment of grape-vines at Nasik, for the control of diseases, was observed in the year under report. This was due to the adoption of sulphur-dusting alone instead of in conjunction with Bordeaux-mixture spraying. The former protects the crop from powdery mildew but not from downy mildew, to prevent which spraying with Bordeaux-mixture is essential. In the year under report the latter disease, downy mildew, was severe and caused considerable crop failure.

The principal additions to our scientific knowledge of plant diseases include :—

(A) The *Sclerospora graminicola* fungus is split into specialized races and the presumed variety of this fungus known as *Andropogonis-sorghii* is really a distinct species which can infect maize and *Euchlaena Mexicana*, and which Dr. Uppal proposes to rename.

(B) It has been ascertained that the variety *Pennisetum typhoideum* does not pass to the species *Setaria* and

Euchlaena Mexicana while the form which attacks *Setaria* spp. can cross-inoculate and also infect *Euchlaena Mexicana* but cannot attack *Pennisetum typhoideum*.

(C) Evidence has been obtained of the identity of *Sclerospora maydis* and *Sclerospora Philippinensis*.

(D) It has been ascertained that the infection of betel vines with wilt disease is chiefly caused by *Phytophthora* sp. during the monsoon, while *Sclerotium rolfsii* causes some damage in the fair season.

(E) It has been ascertained that the *Fusarium* wilt-fungus attacking sann-hemp may be disseminated by non-viable seed which has been found to harbour infected material. On the other hand viable seed has invariably been found to be free from infection.

SOIL FERTILITY

The investigation into the recuperation of nitrogen of the soil was completed in the year under report and a Paper thereon written in continuation of Memoir Vol. VIII, No. 5 of the Chemical Series, dated November 1925, has been accepted by the Imperial Council of Agricultural Research for publication in the Journal of Agricultural Science.

The investigation of the "Karl" soils of the Karnatak has been continued. These occur as patches of any magnitude in the black soils and crops prove difficult to grow thereon. This appears to be the result of the failure of such soils to absorb moisture and part with it readily to plants. Improvement follows the lowering of the pH value. The movement in the soil of plant-food derived from fertilizers applied to the field is another problem under investigation by the Agricultural Chemist.

With the aid of a subsidy from the Imperial Council of Agricultural Research a comprehensive review of all the manurial experiments hitherto undertaken by the Department has been prepared and the results interpreted with the aid of mathematical tests. It is anticipated that this review will provide a new starting point for further research upon the manuring of crops and treatment of land in the Bombay Presidency.

In order to economise effort and resources arrangements were introduced a couple of years ago for the Professor of Agriculture always to conduct a preliminary investigation upon newly put-on-the-market fertilizers like Niciphos at the College

Farm in order to ascertain whether there are *prima facie* grounds for testing such manures at the various Experimental Stations of the Department. In accordance with this plan the following fertilizers are being tested on the marginally noted crops by the Fisher method of field-technique—

Onions.
Chillies.
Jowar (Shalu).

Sulphate of Ammonia.	Amophos.
Calcium cyanamide.	Nitrophoska.
Nitrate of Soda.	Niciphos.

The last named new nitrogenous-phosphatic fertilizer, namely, "Niciphos" has given good results on rice grown on laterite and granite soils of the Ratnagiri and Kanara Districts. No corresponding success over Sulphate of Ammonia has been achieved on the trap soils.

AGRICULTURAL ENGINEERING

The new seed-drill has been further improved in the year under report. The draft of this drill, however, was found to be heavier than that of the deshi drill, and hence the latest improvement has been to substitute hollow steel pieces such as are used in bicycles for solid iron pieces as members of the frame of the drill. In this way, without loss of strength, the draft of the drill has been brought down.

Special attention has been paid to the design of the coulters to suit different depths of sowing and also to adjusting the pitch of the coulters to the surface of the land.

This drill is designed to sow any kind of seed to any depth, from zero up to six inches, and for a seed-rate varying from 3 to 80 lbs. and for rows at varying distances apart.

As regards germination, a recent trial at Manjri showed that the best percentage so far obtained in pot-culture was 89·5 per cent., the best percentage of dibbling was 79·5 per cent. and the best percentage of the improved drill was 94·5 per cent., the latter being with coal dust. Results at Dharwar showed 30 per cent. germination for the country drill, 36·9 per cent. for dibbling and 51·3 per cent. for the improved drill. The tests at the College Farm gave 62·8 per cent. for dibbling and 71 per cent. for the improved drill.

A new Winnower which is now fitted with sieves to deal with bajri, jowar, rice and wheat, was put through exhaustive trials in the villages of Dhanora and Pastana in Erandol Taluka of East Khandesh. Some 20,000 lbs. of jowar bhusa

was winnowed at a cost of Rs. 0-2-7 per 1,000 lbs. of clean grain. The quality of the produce was very good and commanded a premium of $12\frac{1}{2}$ per cent. The time required to winnow 1,000 lbs. of jowar grain was one hour. A similar test on bajri was organized at two centres in Parola Taluka, when some 12,000 lbs. of grain was handled, in this case the date of winnowing 1,000 lbs. of bajri grain worked out at Rs. 0-3-7 per 1,000 lbs. and a similar premium was obtained for the improved quality of the sample.

In the case of wheat it is necessary to have a special drum made of wire gauze having 25 holes to the square inch. In the case of wheat the outturn per hour of clean grain is less, being 300 lbs., and the rate annas 10 per 1,000 lbs. against annas 15 per 1,000 lbs. by the deshi method. Wheat bhusa requires a much stronger air blast than bajri or jowar bhusas, and hence the number of revolutions of the fan requires to be increased.

The percentage of grain to bhusa for different crops worked out as follows :—

Name of crop	Percentages	
	Grain	Bhusa
Bajri	65	35
Jowar	90	10
Wheat	35	65

Similar research is in progress on harrows, hoes, ploughs and a groundnut harvester, while a cotton-stalk extractor has been receiving special attention.

The problem of Mechanical Cultivation has attracted much attention in recent years, but tractors have been mainly designed for American and European conditions, and it is found that they stand in need of many improvements for adaptation to Indian conditions. Thus the following improvements were incorporated by the Agricultural Engineer into a new tractor recently purchased :—

1. A suitable awning to protect the driver from sun and rain.
2. A new set of driving-wheel spade-spuds as the original spuds were found to be useless.
3. An additional tool-box and tools.

4. A spring clutch to hold the rope of the self-lift arrangement.
5. A set of road tyres for transport purposes.
6. A new silencer to deaden the exhaust.
7. Reinforcing the spokes of the hind wheels.
8. Aceteline lamp for night duty.
9. An instrument to record automatically the time the tractor is worked.

A careful trial extending over 82 days was conducted on black soil in the months of February to May 1931 in the Sholapur District with a new 26-40 H.P. Model L Case Tractor. The actual working days were 45 and the area ploughed was 302½ acres, at an average inclusive cost of a little over Rs. 9 per acre. The depth of ploughing varied from 6 to 10 inches. This trial was conducted on the double-shift system.

A new material for the construction of implements has been tested in the year under report called "Framotex Steel" with promising results.

CHAPTER V

AGRICULTURAL PROPAGANDA

Propaganda is that branch of the Department's activities which depends very largely upon non-official co-operation. The small staff of the Department can only directly undertake propaganda in a minute percentage of the villages of the Presidency whereas agricultural improvements lose much of their national value unless they can be caused to materialize over the whole country-side. For this reason the Department is ever on the look-out for ways and means of securing non-official assistance in promoting its propaganda.

The principal non-official agencies which are undertaking agricultural propaganda are :—

- I. Taluka Development Associations.
- II. District Local Boards.
- III. Co-operative Societies.
- IV. Village School-masters.
- V. Business Firms.
- VI. Individual Agriculturists.

The Divisional Boards of Agriculture which are composed of four non-officials and two officials meet quarterly and review the propaganda work of the Department and of these Bodies. Altogether, as shown in the margin, 102 Resolutions of importance were submitted to the Joint Board of Agriculture (consisting of the Director of Agriculture and the Registrar of Co-operative Societies) for disposal, which held four sessions.

Name of Board	Number of resolutions submitted to the Joint Board for disposal
Gujarat ..	9
North Central Division ..	16
South Central Division ..	31
Konkan ..	24
Southern Division ..	20
General ..	2

TALUKA DEVELOPMENT ASSOCIATIONS

These Associations are a great asset to the Department of Agriculture. Although the finances of most of them are small still they have the great advantage of operating within a comparatively small and definite piece of countryside, so that they are essentially local bodies in touch with the people concerned. Each Association maintains at least one demonstrator who soon becomes known in his beat, if he is a capable man. The office bearers also have personal influence within their jurisdiction. Hence it is the policy of the Department to

encourage these bodies in every possible way, and it is a matter for regret that financial stringency is imposing a check upon the expansion and development of these useful institutions. The total number of Taluka Development Associations in the Presidency proper is 68, but no new associations have been registered for two years owing to the inability of Government to provide the subsidy (limited to Rs. 1,000 per annum to each Association). The only exception is Mundargi Petha Mahal Development Association which has been registered recently as a special case, subject to the condition that the subsidy to be paid to it is met from the sanctioned amount for grants-in-aid to Taluka Development Associations, if available. The total No. 68 also includes the Taluka Development Association at Mahad which has been formed in 1929-30 but not registered as yet. These Associations have been classified according to their efficiency and soundness as recorded in Appendix A. Naturally the quality of the work of these Associations varies a good deal but the best of them are doing very useful work of which I give some examples. The Gadag and Ron Associations organized Crop-protection campaigns and carried on propaganda on behalf of the Gadag Cotton Sale Society and assisted the Society to organize its seed-depots. The Chikodi Association devotes its chief attention to the spread of artificial fertilizers. The Mundargi Association is particularly concerned with the elimination of large areas of Prickly-pear which harbour pig which cause great damage to crops. Among the Konkan Associations Sirsi, Dapoli, Palghar and Dahanu deserve special mention. Sirsi has done very useful work in promoting the spraying of Supari (betelnut) palms as a preventive of Koleroga disease. Dapoli has specialized in demonstrations, including plots on cultivators fields. Palghar and Dahanu Associations have acted as distributors of seed and have issued useful leaflets on such subjects as manuring. In the Deccan the Tasgaon Association organized a very successful agricultural show at Bhilawadi. Walva Association organized a land-development class. The Madha and Karmala Associations carried on extensive propaganda in connection with seed-grading (Jowar). In the North Central Division (Khandesh-Nasik) the Taluka Association movement has proved very successful and there are now 22 Associations. The Jalgaon Association has obtained an area of over 400 acres on which to organize a cattle-breeding farm, while the Raver and Bhusawal Associations were sufficiently prosperous to construct substantial buildings for their offices and stores. I have reproduced the

Annual Report of the Jalgaon Association to illustrate what a large amount of useful work can be done by a well-conducted Taluka Development Association. Subsidies of the aggregate value of Rs. 43,316 have been granted to these Associations in the *Presidency* proper. In October 1930 the Marathi-speaking Taluka Development Associations organized a Conference which was attended by representatives from 35 associations. The Honourable Mr. B. V. Jadhav, the then Minister of Agriculture, presided over this Conference and expressed much satisfaction with the work of these bodies.

DISTRICT LOCAL BOARDS

Hitherto District Local Boards have perhaps not been as active as they might have been in promoting agricultural propaganda, but there are a few exceptions. The most notable of these is the Satara District Local Board which some years ago set up an Agricultural Committee of the Board which has taken all the Taluka Development Associations (and there are ten) under its wing with the approval of Government. This Committee directs and co-ordinates the work of the associations and contributes about Rs. 600 towards the finances of each association. During his visit to Satara on 12th July 1930 His Excellency the Right Honourable Sir Frederick Hugh Sykes made the following reference to the agricultural work of the Board :—

“I have learnt with the greatest interest what this District Local Board has been able to do in encouraging and financing Taluka Development Associations. I understand that from 1926 until now, the scheme has been working satisfactorily by which kangars lent by the Agricultural Department have been working under the control of the Agricultural Committee of the Board. The system is now being finally reviewed in the light of experience gained and I trust that it will soon be possible to put it on a more permanent footing.”

CO-OPERATIVE SOCIETIES

The part which Co-operative Credit Societies play in agricultural propaganda consists in the stocking and distribution of the Departmental leaflets. Some of these Societies supply seed and other requisites on the indent system while in connection with loans for land-improvement, such as making embankments or constructing wells, they direct attention to the methods of the Department of Agriculture through employing that Department to examine and approve of the applications and to pass the works when carried out.

It will be remembered that the Royal Commission on Agriculture in India, in Chapter V, Recommendation 29, expressed the view that the Agricultural Department should make more use of Co-operative Credit Societies in their propaganda work, and accordingly the Deputy Director of Agriculture, South Central Division, has made a special effort to give effect to this recommendation. The work done in the year under report in this circle is summarized below :—

District	Name of the Co-operative Credit Society	Work done in connection with agricultural improvements	
		Demonstrations	Extension of agricultural improvements
(I) Poona	(1) Kharpudi	(1) Demonstration of agricultural improvements suitable to village has been undertaken.	50 acres belonging to 29 members was under bajri graded-seed.
	(2) Sakurde	(2) Do.	160 acres belonging to 20 members was under bajri graded-seed.
	(3) Khamgaon	(3) Do.	Nil.
	(4) Supe	(4) Do.	20 acres was under jowar graded-seed of one member.
	(5) Ravangaon	(5) Do.	176 acres and 150 acres of 20 members were under graded-seed of jowar and Pusa-4 wheat respectively. Members have taken 6-sets of dry farming implements.
	(6) Palsdeo	(6) do.	500 acres of 16 members was sown with graded-jowar seed, and one member had 20 acres under dry farming method.
(II) Nagar	(1) Dhorjalgaon	(1) Growing of jowar by dry-farming method.	Nil.
	(2) Erandgaon		
	(3) Vadule		
	(4) Sheogaon	(2) Growing of jowar with graded-seed.	
	(5) Devasade		
	(6) Newasa		
	(7) Vadala.		

District	Name of the Co-operative Credit Society	Work done in connection with agricultural improvements	
		Demonstrations	Extension of agricultural improvements
(II) Nagar— <i>contd.</i>	(8) Khamgaon .. (9) Kashti .. (10) Vadgaon .. (11) Hatgaon ..	(3) Advantages of N. R. cotton, Akola bajri and Pusa wheat No. 4 Pig campaign work has been demonstrated.	Pig and deer campaign for all members was proposed to be undertaken.
(III) Sholapur ..	(1) Temburni .. (2) Akola .. (3) Kasegaon ..	Demonstration of seed grading and dry-farming has been done.	(1) 100 acres of 12 members was under graded-seed, and 4 members had manure pits dug. (2) 200 acres of 15 members was under graded-seed, and two members had manure pits dug. (3) Nil.
(IV) Satara ..	Walva, Koregaon, Karad and Tasgaon Associations have got several societies affiliated to Associations and the demonstration work is conducted through the Members of the Credit Societies.		
(V) Canal Area ..	(1) Balwadi .. (2) Kambleshwar. (3) Late. (4) Wagaj. (5) Sangvi. (6) Bavda. (7) Lasurna.	Demonstration of Manjri method of cane cultivation amongst heavily indebted members.	Plots of cane are arranged and supervised to convince members that Manjri method at less cost gives better yields. Two plots are arranged at Wagaj, 1 at Sangvi, 5 at Kambleshwar and 3 at Lasurna.

The Non-credit Co-operative Societies such as the Cotton Sale Societies, are a still more effective agency for agricultural propaganda because they cater for the supply of agricultural requisites and for the disposal of agricultural produce, and hence it is easy for them to supply seed of the improved varieties of crops recommended by the Department of Agriculture. For example the Gadag Cotton Sale Society supplies seed of the improved cotton known as "Gadag I" for sowing about a lakh of acres.

VILLAGE SCHOOL-MASTERS

In connection with the mass propaganda scheme reported on page 32 of last year's report which was continued in the year under report the District Local Board, Ahmednagar, permitted

19 teachers to help the Department for demonstrating the agricultural improvements embodied in this scheme. In the year under report there were 650 acres under the improved methods in this district and 40 demonstrations were held in connection therewith, and these were attended by nearly 6,000 cultivators; the results obtained are tabulated in the following statement :—

Treatment	Yield per acre		Increase per cent.	
	Grain	Fodder	Grain	Fodder
	lbs.	lbs.	lbs.	lbs.
(1) Dry-farming methods	431	1,204	69	23
(2) Local method	255	975	..	..

Similar work was in progress in Barsi taluka of Sholapur District where eight village teachers were associated with the scheme.

BUSINESS FIRMS

There are now several Firms supplying agricultural requisites such as ploughs and fertilizers and they have established their agents at mofussil centres and some employ demonstrators. These Firms usually take the advice of the Department of Agriculture upon the suitability of their wares and so the Department is able in this way to promote its propaganda. In the year under report the Department has co-operated with Messrs. Burma-Shell and Company in popularizing tractor ploughing in Dharwar District. Two tractors, one a Mercedes Benz and one a Caterpillar were employed and 487 acres were ploughed and the operations were financed through Takavi loans amounting to Rs. 6,760 specially granted by Government. This money was paid direct to the Firm by Government on the certificate of the Department of Agriculture.

INDIVIDUAL AGRICULTURISTS

A good agriculturist who adopts an improvement recommended by the Department is perhaps the best of all advertisements for that improvement. Hence the Department organizes large numbers of demonstrations on cultivators fields and in villages with the help of progressive individuals.

The following statement indicates the scale of these operations in the North Central Division :—

Serial No.	Nature of demonstration	No. of places	Attendance
1	Crop demonstrations	66	750
2	Implement demonstrations	76	1,550
3	Power Chaff-cutter demonstrations	4	250
4	Tractor demonstrations	6	570
5	Gul boiling and improved furnace demonstrations	3	125
6	Jamabandi demonstrations	17	3,000
7	Jowar-steeping demonstrations	270	5,500
8	Magic lantern shows	42	8,500
9	Miscellaneous	22	3,740

In the Konkan 440 demonstration plots were organized in the year under report. Similar demonstrations were organized in other parts of the Presidency, e.g. 83 seed-grading and steeping demonstrations were held in the Sholapur District.

Under this category special attention should be directed to the work of the past students of the Agricultural Schools ; it is reported that 124 past students of the Devihosur school are working on their own farms ; such men are excellent propagandists for the Agricultural Department.

DEPARTMENTAL PROPAGANDA

Agricultural Shows.—The most important Agricultural Show held during the year under report was the Nasik District Show. Mr. R. G. Gordon, the Collector of Nasik District, took the initiative in organizing this Show in 1928 but for various reasons it could not be held till January 1931. About Rs. 25,000 were collected in subscriptions from the general public, but only Rs. 16,000 were spent. The Show was planned on similar lines, though on a smaller scale, to the Presidency Shows at Poona and Ahmedabad in 1926 and 1928 respectively, and the Crop-Court was a special feature of the Show plan. This Show was kept open for about a week and was attended by some 40,000 people. In addition to the Collector the chief credit for conducting this very successful Show belongs to the secretaries the late Rao Saheb K. M. Pawar and Sirdar Vinchurker. It is satisfactory to record that at least one important Implement Firm secured more business from this show than from the Presidency Shows. Numerous smaller shows were held throughout the Presidency, thus there were four Agricultural and Cattle Shows in the Belgaum District, and it is gratifying to record that the Local Fair

Committees took great interest in organizing these Shows with the advice of the Department. In Thana District a Cattle Show held at Dombivli attracted some 8 to 10 thousand people. Cattle Shows were also organized at ten centres in the Southern and Central Divisions, and it is encouraging to note that the people are themselves coming forward with finance to enable us to continue this good work in the face of financial stringency. The Bombay Presidency Poultry Association organized a successful Show in Poona with the aid of the Department.

Demonstrations.—These were held in large numbers all over the Presidency and the chief subjects of demonstration were (1) seed-grading, (2) dry-farming, (3) treating jowar seed against smut, (4) silage-making, (5) spraying and dusting crops against insects and fungoid diseases, (6) improved varieties of crops, (7) chaff-cutting, (8) sugar-making, and (9) magic lantern lectures. Special advantage is taken of the assistance kindly given by Revenue Officers at the time of Jamabandi. The Bombay Presidency Cattle Breeding and Dairy-farming Association has recently embarked upon an active programme of rallies in the mofussil, and the Live Stock Expert is co-operating in this useful work.

CHAPTER VI

AGRICULTURAL EDUCATION

THE POONA COLLEGE OF AGRICULTURE

This Institution has now been in existence for 23 years, and the work went on smoothly and successfully. The following statement shows the number of applications for admission to the College in June 1931 together with the number admitted and present on June 30th, i.e. 20 days after the opening of the session :—

Area	Class	Applied	Admitted	Present on June 30th
Bombay Presidency and its States and Sind.	Degree ..	92	82	58
	Diploma ..	2	..	..
	Short course ..	12	9	9
Other parts of India ..	Degree ..	44	10	6
	Diploma ..	3	..	..
	Short course ..	7	4	3
Total ..		160	105	76

It will be noted that this College attracts a large number of applications from students outside the Bombay Presidency, but the number of such students admitted is limited to ten per cent. of the seats.

Year.	No. of B.Ag.'s
1921-22	44
1922-23	38
1923-24	55
1924-25	59
1925-26	25
1926-27	27
1927-28	38
1928-29	60
1929-30	61
1930-31	53

The marginally-noted figures show the number of students who have graduated (B.Ag.) during the last decade.

Owing to financial stringency Government has recently raised the fees to Rs. 120 per annum and reduced the scholarships both in number and value.

In the year under report 71 candidates appeared for the ordinary degree in Agriculture, B.Ag., and 53 were successful. As regards optional subjects Agricultural Economics still holds first place in popularity with 21 students while plant-breeding and horticulture come next.

There were thirteen post-graduate students in the year under report, ten working for the M.Ag. and two for the M.Sc. and one other.

Efforts are continually made to watch the careers which Agricultural graduates adopt, but experience shows that it is extremely difficult to get any information approaching completeness in this respect. We know that previous to 1918 about 19 graduates adopted agriculture as a profession and that the number from 1918 to 1927 inclusive was approximately 48. Data for the year 1928-29 is not forthcoming but 7 graduates adopted private farming in 1929-30.

The *Vernacular Agricultural School* at Devihosur completed its seventeenth year when there were 36 boys on the roll. There were 127 applications for admission in the year under report. Out of these 60 boys were allowed to appear at the entrance examination, from whom 23 were selected for admission. The scholarship has now been reduced to 5 rupees per month. Most of the admitted boys have a fair education, having passed the Vernacular School Final or the Bias-class Final Examinations. Twelve out of thirteen boys completed the two-years course and passed the examination. It is reported that out of the past students 124 are working on their farms and 20 attended the annual social gathering, bringing with them their annual reports of the work done on their farms, the discussion of which forms a special feature of the re-union.

The *Vernacular Agricultural School* at Dhulia is also doing good work.

Vernacular Agricultural Education has suffered heavily under the Retrenchment Axe in the year under report when three out of a total of six schools were closed; these were Godhra, Surat and Jambul.

It was observed in the year under report that the *Agricultural bias-class-movement* continues to make progress and to attract public approval.

CHAPTER VII

FINANCE AND ADMINISTRATION

FINANCE

The expenditure of the Department amounted to Rs. 17,84,896 as against Rs. 18,63,860 in 1929-30, distributed as shown in the margin. The receipts of the Department for the year under report amounted to Rs. 2,62,416 as against Rs. 2,85,750 in 1929-30. Owing to the grave financial crisis brought about by economic and political forces the resources of the Department have been materially reduced under the Retrenchment Axe. The year under report has in fact been marked by searching stock-taking and the pruning-away of any post, institution or activity that could permanently or temporarily be dispensed with. These proceedings are still in progress and the final recommendations of the Retrenchment Committee will not be known for some time yet.

The principal losses so far sustained are :—

I. The temporary closing down of Boring operations, involving the dismissal of 13 permanent and 107 temporary men.

II. The reduction of the water-finding staff from 4 to 1 agricultural graduate.

III. The closing down of three Agricultural Schools, Jambul, Surat and Godhra. There were about 30 boys at each of these schools.

IV. The closing of the Government Farm at Amalsad.

V. The keeping in abeyance of the following appointments, arising out of II, III and IV above :—

- 1 post of Divisional Superintendent of Agriculture.
- 11 posts of graduate assistants.
- 5 posts of non-graduate assistants.
- 4 posts of assistant Masters.
- 3 clerks and storekeepers.
- 9 mukadams and servants.

The closing of Godhra School is particularly to be regretted as this school was attracting boys of the right type from the Dharalas class.

The interpretation which an observer might be inclined to put upon this situation is that the departmental machine has been slowed down, but this is not so. Side by side with the incurrence of these losses the department has been actively spreading its net with the aid of financial support from such Bodies as the Indian Central Cotton Committee, the Imperial Council of Agricultural Research and the Sir Sassoon David Trust Fund. During the year under report the following important schemes have been on the anvil:—

Name of scheme	Period of scheme in years	Cost of scheme in rupees	Present position
The Banilla Scheme ..	5	2,70,340	Sanctioned by the Indian Central Cotton Committee in December 1930 and launched in May 1931.
The Sugarcane Research Scheme for the Bombay Deccan.	5	5,22,088	Sanctioned in May 1931. To be launched in October 1931.
The Dry-farming Research Scheme for the Bombay Deccan.	5	3,98,151	Recommended to the Governing Body by the Advisory Board of the Imperial Council of Agricultural Research in June 1931.
The Virus Diseases Scheme..	5	65,390	Sanctioned in May 1931 by the Imperial Council of Agricultural Research. To be launched shortly.
The Spotted Boll-worm Clean-up Propaganda Scheme.	1	31,490	Sanctioned in December 1930 by the Indian Central Cotton Committee. Launched in April 1931.

Subsidies were received from the Indian Central Cotton

- Ra.
- (1) 32,815 for the Cotton Physiological Research Scheme at Surat.
 - (2) 18,607 for the Earias Boll-worm Scheme at Surat.
 - (3) 22,293 for the Cotton-wilt Research Scheme at Dharwar.
 - (4) 23,289 for the Cotton Physiological Research Scheme at Sakrand.
 - (5) 5,225 for part cost of the Khandesh Cotton-breeding Scheme at Dhulia.
 - (6) 6,722 for the Surat Cotton-Seed Distribution Scheme.
 - (7) 6,426 for the Hubli Cotton-Seed Multiplication Scheme.
 - (8) 8,264 for the Gadag Cotton-Seed Multiplication Scheme.

1,23,641

MO Q 55—5

Committee for the marginally noted Schemes to the amount of Rs. 1,23,641, and the expenditure under this head in the year under report was Rs. 1,15,930.

The following amounts were received during the year from the Sir Sassoon David Trustees :—

Rs.

- (1) 1,750 for the Rice Pathological Research Scheme in Sind.
- (2) 4,645 for the Research work on Wilt-Disease of Sann-Hemp.
- (3) 4,500 for the Premium Bull Scheme.
- (4) 2,600 for the Vegetable Research Scheme.
- (5) 1,000 for the Purchase of a Power-Dust-sprayer.
- (6) 600 for the Scheme for the Study of Disintegration of Bones.
- (7) 2,825 for the Power-Chaff-Cutter Scheme.
- (8) 700 for the Investigation in connection with the Improvement of Grazing Lands.
- (9) 5,200 for the Investigation in connection with Drought Resisting Crops—especially bajri.
- (10) 3,100 for the Investigation of Mango Blight.
- (11) 3,000 for the Testing of New Nitrogenous Artificial Manures.
- (12) 2,400 for Castor Research.
- (13) 500 for a grant-in-aid to the Vernacular Agricultural School, Dhulia.

32,820

As regards the Personal Ledger Account which is used for financing the supply of agricultural requisites like seed and implements, the total amount advanced was Rs. 1,14,651 while the recoveries credited during the year were Rs. 1,18,053.

ADMINISTRATION

Mr. T. F. Main, Director of Agriculture, returned from leave on the 6th June 1930 when Dr. Burns, who had been acting Director, proceeded on leave till the 17th October 1930. Several other officers were on leave during part of the year, including Rao Bahadur P. C. Patil for four months, Mr. N. V. Kanitkar, Soil Physicist to Government, for eight months and Mr. B. S. Patel, Deputy Director of Agriculture, Gujarat, for four months. The principal vacancies were filled by Rao Bahadur Patil and Mr. V. G. Gokhale both of whom acted as Principal of the College of Agriculture for short periods and

Mr. C. S. Patel who acted as Deputy Director of Agriculture, Gujarat. Towards the end of the year Dr. Cheema proceeded on six months leave to take advantage of a scholarship granted by the Empire Marketing Board for making a special study of the latest methods and technique in transporting to and marketing fresh fruit in foreign markets. Mr. H. P. Paranjpye is filling this vacancy. Professor Rao Bahadur Sahasrabuddhe was placed on special duty for three months at the expense of the Imperial Council of Agricultural Research to review all the past work of the Department on the manuring of crops. Mr. V. N. Gokhale filled this vacancy. Professor J. P. Trivedi, Mr. F. J. Master and Mr. M. L. Patel were also on short leave during the year. Mr. Y. R. Gharpure filled the vacancy of the Personal Assistant to the Director of Agriculture.

Messrs. W. J. Jenkins, V. A. Tamhane, K. I. Thadani, K. M. Pawar, G. S. Kulkarni, N. V. Kanitkar, V. R. Dharwarkar, and Rao Saheb B. P. Vagholkar continued, during the year, to be on deputation, and the following gentlemen held, respectively, the acting vacancies :—

1. Rao Saheb Pawar as Deputy Director of Agriculture, N. C. D., Nasik, till his premature death in January 1931.
2. Mr. N. V. Kanitkar as Soil Physicist to Government (Manjri Farm) till 1st December 1930 and Mr. V. G. Patwardhan.
3. Mr. B. B. Desai as Cotton-Breeder in Sind.
4. Mr. R. Y. Hulkoti as Inspector of Agricultural Schools, Poona.
5. Dr. B. N. Uppal as Plant Pathologist to Government, Poona.
6. Mr. V. G. Patwardhan as Assistant Professor of Chemistry.
7. Mr. S. V. Shevde as Cotton Superintendent, S. M. C.
8. Mr. G. P. Patil as Divisional Superintendent of Agriculture, Deccan Canals.

Mr. M. N. Kamat acted as Assistant Professor of Mycology during the deputation vacancy of Dr. Uppal till the end of March 1931 when he was reverted to his original post in the cadre of Graduate Assistants.

Mr. G. P. Pathak also acted as Cotton Superintendent, Gujarat, in the deputation vacancy of Mr. C. S. Patel. Messrs. V. N. Gokhale and B. H. Patil acted respectively as Agricultural Chemist to Government and Assistant Professor of Chemistry during the deputation vacancy of Rao Bahadur Sahasrabuddhe.

Mr. N. V. Bhagwat was temporarily appointed to act as Deputy Director of Agriculture, N. C. D., for five months.

The most important administrative event of the year under report was the Agricultural Departmental separation of Sind from the Presidency proper, which took effect on the 10th November 1930.

The year has also been marked by the recruitment of two highly qualified officers in the persons of Mr. L. S. S. Kumar to the post of Assistant Professor of Botany and Dr. M. K. Patel to the post of Assistant Professor of Mycology at the College of Agriculture.

The post of Cotton Research Officer, sanctioned by the Indian Central Cotton Committee, remains unfilled owing to the difficulty of the Indian Central Cotton Committee of finding a suitable incumbent.

The Department sustained a severe loss in the premature death of Rao Saheb K. M. Pawar, Deputy Director of Agriculture, N. C. D., which sad event took place on the 24th January 1931. Rao Saheb Pawar was one of the most effective Propagandist Officers so far turned out by the Bombay Department of Agriculture and he made excellent use of his talents in the Khandesh-Nasik area where, *inter alia*, he played an important part in making the Taluka Agricultural Development movement so successful. When some forty representative officers of the Department of Agriculture met in Poona in May 1931 to attend the Departmental Research Conference the following resolution was placed on record to mark the Department's corporate sense of loss in the death of Rao Saheb Pawar :—

“The members of the Crop Research Committee record their deep sense of sorrow at the untimely death of Rao Saheb K. M. Pawar, Deputy Director of Agriculture, N. C. D. They express their profound sympathy with the family of the deceased, and request the Director of Agriculture to convey this resolution of condolence to them.”

During the year under report the Department lost, through retirement, another experienced officer in Mr. G. B. Patwardhan, Assistant Professor of Botany at the College of Agriculture. Mr. Patwardhan put in a long service of useful work in the Department and on several occasions acted as Economic Botanist to Government.

PERSONNEL

I do not usually take up space in this Report with reference to the staff, but I propose to make some observations on this occasion with a view to recognizing good work.

Among the Deputy Directors, whose duties are manifold in the spheres of Organization, Investigation, Propaganda and Service, I consider that the officers who have achieved most are :—

Rao Saheb B. P. Vagholkar, and

Mr. S. S. Salimath.

Among the Specialist officers I would single out the record of Mr. W. M. Schutte in the two capacities of (1) able-designer and (2) hard-worker. In this class I also make reference to Mr. Bruen and Dr. Cheema because of their respective successes in securing the confidence of professional Cattle-breeders and professional Nursery-men and Fruit-growers.

Among the Scientific workers I would pick out Dr. Burns and Dr. Uppal for special mention, and in this class I should also include Rao Saheb G. L. Kottur whose work on the improvement of Kumpta cotton is one of the best performances in the Department.

I also wish to recognize the hard work done by Rao Bahadur P. C. Patil in building up the foundations of the subject of Agricultural Economics in this Presidency and in impressing the importance of this subject upon the College students as evidenced by the large number of men who take Economics as their special subject in the B.Ag. degree.

Among the best thinkers and critics in the Department I assign a high place to Mr. B. S. Patel. Among good collaborators I would mention Professor Rao Bahadur Sahasrabudhe. In the sphere of original work I consider the outstanding achievement, of the year under report, was Mr. Prayag's success, at Dhulia, in piloting the first Regulated Cotton Market Committee through its first year.

In the Upper Subordinate ranks I would pick out Mr. H. M. Desai and Mr. N. V. Bhagwat although there are other men of perhaps equal merit.

As regards the staff of my own office the main burden is ably carried by Mr. F. J. Master, Mr. Y. R. Gharpure, Mr. V. G. Kelkar and Mr. G. R. Ambekar.

PUBLICATIONS

The Department has published during the year under report the following memoir, bulletins and leaflets :—

MEMOIRS (NOW PUBLISHED AS PAPERS IN THE INDIAN
JOURNAL OF AGRICULTURAL SCIENCE)

Paper on "Nitrogen Recuperation in the Soils of the Bombay Presidency", Part II, by Rao Bahadur D. L. Sahasrabuddhe and Mr. B. H. Ghatikar.

BULLETINS

1. Bulletin No. 162 of 1930—Papaya cultivation in the Bombay Presidency (excluding Sind), by Dr. G. S. Cheema and Mr. P. G. Dani.
2. Bulletin No. 163 of 1930—Powdery mildew of the grape and its control in Bombay by Dr. B. N. Uppal, Dr. G. S. Cheema and Mr. M. N. Kamat.
3. Bulletin No. 164 of 1930—Study in intensive farming near Poona, under canal irrigation, by Mr. B. S. Patel and Mr. H. M. Desai.
4. Bulletin No. 165 of 1930—The frost of January 1929 and its damage to crops of the Bombay Presidency, by Mr. K. V. Joshi.

LEAFLETS (WITH VERNACULAR VERSIONS)

1. Leaflet No. 3 of 1930—Useful hints for the cultivation of groundnut (in Gujarati only).
2. Leaflet No. 4 of 1930—Important hints to growers of Banilla cotton (in Marathi only).
3. Leaflet No. 5 of 1930—Reclamation of salt lands in the Gokak Canal tract.
4. Leaflet No. 6 of 1930—Mango-hoppers and mildew and their control.
5. Leaflet No. 7 of 1930—Destruction of rice grass-hoppers.
6. Leaflet No. 8 of 1930—Economic manures for garden crops in the North Konkan.
7. Leaflet No. 9 of 1930—Control of the red pumpkin beetle.
8. Leaflet No. 10 of 1930—Risks associated with the practice of suspense sales of seed-cotton and advice upon how to pack seed-cotton in carts (in Marathi only).
9. Leaflet No. 11 of 1930—Rabi cultivation of chillies in the Konkan.
10. Leaflet No. 1 of 1931—Grading of mangoes.

T. F. MAIN,

Director of Agriculture,
Bombay Presidency.

Poona, 17th September 1931.

APPENDIX A.

LIST OF TALUKA DEVELOPMENT ASSOCIATIONS ORGANISED
UP TO DATE.

According to the scheme laid down in Government Resolution, No. 3378 of 5th June 1922, Revenue Department, 84 Taluka Development Associations were formed till last year (1929-30). Out of these, 15 associations in Sind being omitted due to its separation and one Association in the South Central Division being defunct during the year under report, the total number of the Taluka Development Associations in the Presidency Proper now stands at 68 as shown below :—

Division	District	No.
Gujarat	{ Surat	3
	{ Ahmedabad	1
	{ Kaira	2
Khandesh and Nasik	{ East Khandesh	10
	{ West Khandesh	7
	{ Nasik	5
South Central Division	{ Poona	3
	{ Sholapur	2
	{ Satara	10
Southern Division	{ Belgaum	4
	{ Bijapur	2
	{ Dharwar	7
Konkan	{ Kanara	2
	{ Ratnagiri	4
	{ Thana	4
	{ Kolaba	2

No new associations were formed during the year under report (1930-31) as the formation of new associations is not encouraged owing to financial restrictions. Out of the two Taluka Development Associations, Mundargi (District Dharwar) and Mahad (District Kolaba) that were formed in 1929-30, the former has been registered on 13th March 1931 and the latter has not been yet (till the end of June 1931) registered.

Subsidies amounting to Rs. 43,316 have been granted during the year under report (1930-31).

The associations have been classified by the Divisional Boards of Agriculture in order of merit as under :—

Class A—The most successful or efficient.

Class B—Struggling associations which deserve help if possible.

Class C—Moribund associations.

Accordingly the number of associations in each class is as under :—

Division	Class		
	A	B	C
1. Gujarat	5	..	1
2. Khandesh and Nasik	12	8	2
3. South Central Division	6	8	1
4. Southern Division	7	3	2
5. Konkan Division	4	7	..
34 26 6 = 66			

These exclude the two new associations mentioned above (i.e. Mundargi and Mahad) that are not classified.

The six Moribund associations (viz. Yaval, Edlabad, Jamner, Kalyan, Ratnagiri and South Daskroi) have been given notices that Government are not in a position to grant further subsidies to them. I reproduce below the Annual Report of the Jalgaon Agricultural Development Association to illustrate what a large amount of useful work can be done by well conducted Taluka Development Associations.

SUMMARY OF THE WORK DONE FOR THE YEAR 1930-31.

The Association has been audited on 7th August 1931 and is classified as "A" class Taluka Development Association. The total number of the members of the Association at present is 1,573 of whom two are life members and 45 Society members and others are individual members. The subscription collected during last year comes to Rs. 903.

Names of the Office Bearers.

The following are the office-bearers for the year 1930-31 :—

Mr. Sitaram Nana Chaudhari ..	Jalgaon ..	President.
Mr. D. B. Unde, B.A., Mamlatdar ..	Do. ..	Vice-President.
Mr. Gulam Rasul Hasanoddin Meharun ..	Do.	
Pirjade.		
Mr. Trimbakrao Bapurao Bhoyate ..	Jalgaon ..	Honorary Secretary.
Mr. V. S. Savant, B.A., LL.B., Pleader. Do. ..	Do.	

The members of the Managing Committee are :—

1. Mr. Shamrao Nana Patil ..	..	Dhanvad.
2. Mr. Madhaorao Balkrishna Kulkarni ..	..	Chincholi.
3. Mr. Dodhu Vyankatrao Patil ..	..	Kandari.
4. Mr. Dodhu Garbad Patil ..	..	Mhasavad.

- | | | |
|--------------------------------------|----|-------------|
| 5. Mr. Muniruddin Kamruddin Pirjade | .. | Meharun. |
| 6. Mr. Kesharao Tulshiram Patil | .. | Jalgaon. |
| 7. Mr. Dodhu Ramchandra Patil. | .. | Phupnagari. |
| 8. Mr. Daji Barku Patil | .. | Nandra. |
| 9. Mr. Balvant Ganesh Patil | .. | Bholane. |
| 10. Mr. Gajanan Ramchandra Vyavahare | .. | Nasirabad. |
| 11. Mr. Hiralising Sampat Patil | .. | Vitner. |

The Taluka Development Association having the principal depôt and Office in its own building at Jalgaon maintains three depôts at Nandra, Mhasavad and Nasirabad with a view to decentralise its work and to reach the corners of the Taluka for propaganda and demonstrations.

The Association maintains one Overseer, Mr. T. T. Salunkhe, on a pay of Rs. 60 *plus* Rs. 20 travelling allowance. His energetic and sincere work is already known. He has passed the test of Loni Agricultural School. Besides there are three Depôt Kamgars Mr. Dodhu Gangaram Patil, Mr. Pandurang Vishnu Kale and Mr. Sakharam Sona Chaudhari working at Depôts at Mhasavad, Nasirabad and Nandra respectively. The Kamgars have passed the test of Loni Agricultural School. Their pay is Rs. 20 each *plus* Rs. 6 travelling allowance. A Supervisor for co-operative work Mr. D. G. Patil has passed the test of Loni Agricultural School and all the papers of the Supervisor's Diploma Examination except accounts. One clerk is appointed from the year 1928 to cope with heavy and increased clerical work of the Association.

The work 1929-30 compare with that done during the current year 1930-31 :—

1. 136,321 lbs. of castor cake was distributed during the year, 34,384 lbs. of Ammonium Sulphate and other manures like Groundnut cakes, Nitrate of Soda and Superphosphate were also sold in large quantities.

2. 130 demonstration plots of Cotton, Akola Bajari, Groundnut, Chillies, Jowar and plantain and Sugarcane were undertaken during the year.

3. 99,463 lbs. of Banella Seed and 21,977 lbs. of N.R. Seed were issued to cotton growers this year.

4. Akola Bajari 430 lbs. and 890 lbs. of Elichpuri Jowar, 50 lbs. of Bhendi, double beens, Karli, and Tomato were distributed in the Taluka during the current year.

5. 39 iron ploughs demonstrations were held in the year 1929-30. Seven iron mhot wheels and 12 iron ploughs, small five heavier iron ploughs were also ordered out and made available to the Agriculturists. Over Rs. 302 were earned during the last year on account of sale of spare parts of implements. This season the plough hire amounts to Rs. 461-5-0 up to date.

6. Two demonstrations were held in winowing with the help of winowers.

7. Eleven demonstrations were performed in Bunding.

8. Purification Classes of Banilla Cotton plants were held in 25 villages.

9. Four Premium bulls were placed in villages and the Agriculturists in adjoining villages were given information on all points regarding premium bulls. Three more premium bulls had to be ordered and now in all the Association is able to provide six villages with one premium bull each, one of the first four being dead.

So also the method of checking rat-attack with arsenic baits, was shown in two villages and found useful in Sugarcane and Wheat crops.

It may be stated here that the Association has during the last 18 years been able to progressively do the following :—

1. Introduction and extension of Akola Bajari.
2. Introduction of Orange and Mosambi fruit gardens in the Taluka.
3. Introduction and extension of N. R., Banilla Cotton and Spanish Groundnuts.
4. Introduction of iron ploughs, iron mohots and implements.
5. Introduction of artificial manures and oil cakes.
6. Introduction of Leghorne poultry.
7. Introduction of Bunding Scheme at Chincholi and Nasirabad and Shelgaon.

In brief the Association is trying to bring home to the Agriculturists in this Taluka facilities for better farming. Amongst the more important distinguished visitors to this Institution during the recent years may be mentioned :—

1. The Honourable Mr. A. M. K. Dehlavi, President, Bombay Legislative Council, the then the Minister for Excise, Forest, and Agriculture.
2. Mr. G. F. S. Collins, I.C.S., O.B.E., the then Registrar of Co-operative Societies, Bombay Presidency, Poona.
3. Dr. H. H. Mann, D.Sc., Director of Agriculture, Poona.
4. Mr. V. S. Bhide, I.C.S., Registrar of Co-operative Societies, Bombay Presidency, Poona.
5. Mr. T. F. Main, O.B.E., B.Sc., Director of Agriculture, Bombay Presidency, Poona.
6. L. N. Brown, Esq., I.C.S., Collector, East Khandesh.
7. The Honourable Mr. B. V. Jadhav, Minister of Agriculture, Government of Bombay.
8. Dr. W. Burns, Director of Agriculture, Bombay Presidency, Poona.
9. Mr. E. J. Bruen, Live [Stock Expert to Government, Bombay Presidency, Poona.
10. Rao Bahadur P. C. Patil, Principal, Agricultural College, Poona.

11. Professor V. G. Kale, M.A., Vice-President, The Bombay Provincial Co-operative Institute.

12. S. S. Salimath, Esq., Deputy Director of Agriculture, South Division, Dharwar.

The Association has proposed to open Nemad Cattle Breeding Farm at Pimpala near Chincholi 9 miles from Jalgaon. Collection of Rs. 6,000 for this purpose have been made at the rate of 3 pies per Rupee of the Land Revenue Assessment with the sanction of the Collector. This attempt, it is hoped, will be an important step towards the improvement of cattle breed not only for Jalgaon taluka but for the whole of East Khandesh District by way of example. With great efforts the Association has been able to secure a forest area of 200 acres for the purpose on lease of ten years from the Government (*vide* G.R., R.D., No. 3286/28, dated 28th August 1930 at a concession rate of Re. 1 per acre. A temporary tin Shade has been erected for storing fodder bales. At present 1,000 bales have been stored in the shade. The Association is now trying to secure an adjoining survey number for the purposes of erecting a Stable and the fieldman's quarters, and then the farm will be duly started.

This Association has arranged to get the market quotations of Cotton from the Bhagirath Spinning and Weaving Mills, Jalgaon, and to disseminate the same through the depôt by putting these on boards.

The Association owns a building of its own in which the office is situated. It has also obtained Revenue free two pieces of Land opposite to its own building measuring 95 square yards and three gunthas respectively.

With a view to promote the growing product of plantains in the taluka it was highly essential that the Railway Company should have continued with the recently stopped concessions regarding the conveyance of fruit. The Association has passed a resolution in their general meeting and to revive the concession wants and move the Railway Authorities through the Collector, East Khandesh, in the matter.

Co-operative Work.

Since the estion of arranging Supervision of the Co-operative Societies in Jalgaon Taluka was taken up by the Association and a Supervisor been appointed 45 societies have been so far affiliated to this Association. The Supervisor has paid 149 visits to these societies. Arbitration cases from 14 societies have been forwarded to the Assistant Registrar. Asset registers have been completed in 9 societies and all societies were inspected and the accounts were completed where found incomplete. A circular was issued also, directing the societies to purchase necessary account forms through this Association.

Recovery of debts was stimulated by the circulars and personal visits of the Supervisors. Association has decided to raise 4 annas P.C. on the working capital by way of subscription for Supervision. In the year 1930-31 the income of supervision fee from societies are Rs. 1,000. Expenses incurred to the Supervision Rs. 796-1-0.

The condition of the four societies, viz. Bhokar, Bhadli Kd., Fupani and Jamod in the Bhokar group is very unsatisfactory. The Association formed a special group of the said societies and appointed Mr. G. S. Dhake who passed his Senior Secretary Examination, on Rs. 25 p.m. There is, therefore, much hope to bring the societies to an upward position.

Balance-sheets of all societies in the taluka were prepared and proper instructions left to the people concerned. Loans amounting to Rs. 216,888 were recommended to societies. Besides this an amount of Rs. 25,650 has been recommended under the scheme for redemption of old debts.

With a view to get best prices and get rid of middlemen the Association has undertaken pains and got registered the Sale Society at Jalgaon. It has a membership of 254 including Co-operative Societies and collected Rs. 8,730 as share-capital. It has begun its work in November 1928, and has been found to be a healthy institution for the Agriculturists. The above items will speak of themselves of the work done by the Association in the past. It has been moreover trying to enter into all the requirements and grievances of the Agriculturists and take them right up to the Government if so required. It will be taking up the remaining important problems as early as possible and hence the following requests may be favourably considered :—

With a view to extend the helping hand, this local body most sincerely requests that the Government should be requested to finance it on more liberal basis to enable it to take up more comprehensive schemes and meet the needs of the Agriculturists for whom it is primarily started.

The Cattle breeding farm is going to be a very costly scheme in its initial stages. The Director of Agriculture is therefore requested to move the Government to give us the services of an officer of the Agricultural Department to work as the Superintendent of the farm for a period of five years at the end of which the Association expects the farm to be self-supporting.

The plantain crop in this district is immensely increasing and it is essential that the Railway Company should again revive the concession rates for the conveyance of fruit. The Director of Agriculture is requested to move the Government and the Railway Authorities to sympathise with the fruit growers and order the concession to be revived.

With a view to facilitate a greater spread of Banilla, Director of Agriculture is requested to allow the Association to sell Banilla seed to Agriculturists on credit for the period of a season. The Association is prepared to amend its Bye-laws if so required.

A Bunding scheme has been prepared at Shelgaon. The Director of Agriculture is requested to move the Government to sanction long term Tagai Loans to the villagers.

The Director of Agriculture is further requested to sanction us a grant of at least two premium bulls every year.

The Association hopes that the Director of Agriculture will give a kind and sympathetic consideration to all its requests as made above.

APPENDIX B.

SUMMARY OF WORK DONE AT THE POONA AGRICULTURAL COLLEGE
FOR THE YEAR 1930-31.*General.*

The year under report is the 23rd year of the life of the College as a separate institution. Work went on smoothly and successfully. The Honourable Dewan Bahadur S. T. Kambli, Minister of Agriculture, paid his first visit to the College on December 12, 1930. Among other distinguished visitors were the Nawab of Savanur, the Maharaj Kumar Saheb of Kutch, and Dr. B. A. Keen (of the Rothamstead Experiment Station, England, and at present Director, Agricultural Experiment Station, Pusa).

Examination Results, 1931.

For the Intermediate Examination in Agriculture of the Bombay University 94 candidates appeared, of whom 60 passed, the pass percentage being 63·8.

For the Bombay University examination, for the degree of Bachelor of Agriculture, 71 candidates appeared of whom 53 passed giving a pass percentage of 74·7. There were five diploma students of whom three passed. The 76 candidates had elected optional subjects as follows :—

Optional Subject	Candidates appeared	Candidates passed
Intensive Study of Certain Crops—		
Rice	2	1
Cotton	5	3
Sugarcane	7	6
Advanced Plant Breeding	12	10
Advanced Agricultural Chemistry	5	2
Do. do. (for Diploma)	1	1
Advanced Animal Husbandry and Dairying	2	1
Do. do. (for Diploma)	1	..
Advanced Agricultural Economics	19	17
Advanced Horticulture	12	8
Do. (for Diploma)	3	2
Advanced Plant Pathology	7	6
Total ..	76	56

In the part examination at the end of the second year in which candidates may sit for examination in the subjects of Agricultural Botany and Plant Pathology 61 degree candidates appeared and 59 passed in both subjects and 2 passed in one subject. Four diploma students appeared and passed in both subjects.

In the examination for the students who have taken the one year short course, 10 appeared and 8 passed.

The number of students doing post-graduate work at the College during the year was 10 for M.Ag., 2 for M.Sc., and one other student.

Admissions, 1931-32.

The numbers who applied for admission who were actually admitted and who were present in the College on June 30, 1931 (i.e. 20 days after the beginning of the College session), are given below :—

Area	Class	Applied	Admitted	Present on June 30
Bombay Presidency and its States and Sind.	Degree ..	92	82	58
	Diploma ..	2	..	..
	Short Course ..	12	9	9
Other parts of India ..	Degree ..	44	10	6
	Diploma ..	3	..	..
	Short Course ..	7	4	3
Total ..		160	105	76

Scholarships and Fees.

For both the Presidency proper and Sind the number of scholarships has been reduced, and the values altered. The numbers and values of scholarships awarded this year are : for Sind, four scholarships of the value of Rs. 20 per month each (of these 2 have been awarded to Mahomedans and 2 to Hindus) ; for the Presidency proper 8 scholarships of the value of Rs. 20 each of which five are reserved for backward classes and three for open competition.

Along with the change in scholarships has occurred an increase in fees, old students from the Bombay Presidency being now charged a tuition fee of Rs. 80 per year instead of the previous Rs. 60, all new students, and also old students from outside being charged Rs. 120.

Optional subjects elected by students in their final year (1931-32).

The figures of the previous two years are given for comparison :—

	1929-30	1930-31	1931-32
Intensive Study of certain crops—			
Rice ..	..	2	..
Rice (for Diploma) ..	1	..	..
Cotton ..	7	5	4
Sugarcane ..	8	7	7
Advanced Plant Breeding ..	11	12	13
Advanced Agricultural Chemistry ..	10	5	8
Do. do. (for Diploma) ..	..	1	1
Advanced Animal Husbandry and Dairying ..	8	2	2
Do. do. (for Diploma) ..	1	1	1
Advanced Agricultural Economics ..	17	19	21
Do. do. (for Diploma) ..	..	..	1
Advanced Horticulture ..	13	12	10
Do. (for Diploma) ..	1	3	1
Advanced Plant Pathology ..	1	7	2
Total ..	78	76	71

Careers of Students.

It continues to be difficult to trace our men after they leave as many will not reply to queries asking them to report their employment. Of the 61 men who graduated in 1930 no information is forthcoming from 22 of them. Of the remaining 39, 12 are unemployed, one is studying for the M.Ag. degree, one has gone to Germany for post-graduate work, seven have gone in for farming and 18 are employed in various kinds of service (mostly agricultural).

Athletics and social activities.

The U. T. C. platoon under the command of Lieut. K. S. Kulkarny was up to strength and as usual went into camp during the Christmas vacation, 1930. It then was successful in winning the Inter-Platoon Shooting Shield and a number of sports prizes. Lieut. K. S. Kulkarny was attached in 1930 to the 1st (Marine) Battalion, Bombay Pioneers, for training and in 1931 has been attached to the 2nd Battalion 5th Maratha Light Infantry, Poona, for the same purpose.

Under Mr. A. A. Vasavada, the College Rover troops continued to do excellent work, and put up a fine display at the time of their annual Camp Fire which was largely attended.

The College Gymkhana prospered under the able guidance of Dr. G. S. Cheema who himself took part on tennis, cricket and hockey and by his genial leadership helped the gymkhana greatly. The cricket team did specially well in the year under report. There were no Inter-Collegiate Sports in 1930-31, and hence the College athletes had no opportunity to measure themselves against their fellows in other colleges.

The University of Bombay has initiated a scheme for compulsory physical training and appointed a Director of Physical Training. It is hoped that much good will result from this new effort.

The College playing field is now restored to its full size by the demolition of a temporary barrack which has stood on it since the War. This will now give an area which is a full sized cricket field and which can be sub-divided into a football and a hockey field. The demolition of the barrack has reduced the hostel accommodation and a larger proportion of students have now to seek accommodation outside the hostel. This is unfortunate but at present there seems no possibility of getting increased hostel accommodation as the scheme for such accommodation administratively approved in Government Memorandum No. 4753-A/24, dated 28th September 1929 (Revenue Department), and for which an allocation of funds has been made was not finally sanctioned.

The Nusserwanji Sorabji Veterinary Hospital.

The number of in-patients treated during the year was 468 and the number of out-patients was 4,508.

This hospital reconstructed last year from a generous donation of Rs. 30,000 given by Bai Sakarbai Nusserwanji Anklesaria is an

institution with a double usefulness, being a source of healing and relief to many suffering animals and also an essential part of the teaching installation of the College of Agriculture.

Personnel.

The following in brief are some of the main changes during the year.

Dr. W. Burns, the Principal, returned from leave on October 19. During his absence Professor V. G. Gokhale had held charge till August 31 and Rao Bahadur P. C. Patil till October 19, 1930. Professor G. B. Patwardhan, Assistant Professor of Botany, after long and useful service retired from Government employment on October 24. Rao Bahadur D. L. Sahasrabuddhe, Professor of Agricultural Chemistry was put on special duty for three months for the working up of all fertiliser researches done by this Department, and during his absence Mr. V. N. Gokhale acted as Professor and Mr. B. H. Patil as Assistant Professor of Agricultural Chemistry. Among new appointments may be mentioned the appointment of Mr. L. S. S. Kumar, M.Sc., to the post of Assistant Professor of Botany and Dr. M. K. Patel to the post of assistant professor of Mycology. Dr. G. S. Cheema has gone on six months' leave from May 10, 1931, having been granted a scholarship from the Empire Marketing Board for the study of the handling, storage and marketing of fruit. Mr. H. P. Paranjpye, District Horticulturist acts for him.

The College and the Bombay University.

The College is becoming more and more a partaker in the life of the University. From the Department and the College there are representatives on the Senate, the Academic Council, the Board of Post-Graduate Studies, the Faculty of Science, the Board of Studies in Agriculture and the Board of Studies in Botany.

W. BURNS,

Principal,

COLLEGE OF AGRICULTURE :

Poona, 8th July 1931.

College of Agriculture, Poona.

APPENDIX C.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, NORTH CENTRAL DIVISION, NASIK,
FOR THE YEAR 1930-31.*I. Staff.*

Rao Sahab K. M. Pawar was in charge of the Division till 24th January 1931 when unfortunately he expired after some illness and Mr. N. V. Bhagvat, the Cotton Supervisor, Jalgaon, took charge of the Division who held it till 30th June 1931. Mr. S. H. Prayag continued to work as Cotton Breeder during the year except from 27th April 1931 to 15th June 1931 when he went on leave. Mr. N. V. Bhagvat was in charge of the office of the Cotton Supervisor, Jalgaon and in addition held charge of the office of the Deputy Director of Agriculture as mentioned above.

2. The Indian Central Cotton Committee sanctioned the Banilla Cotton Expansion Scheme during the year and it came into operation from 1st May 1931. Mr. S. V. Shevde, the Acting Cotton Superintendent, Dharwar, was put in charge of the scheme and he joined his duties in the first week of July 1931. Mr. G. S. Moghe, Superintendent, Jalgaon Farm, was deputed to this scheme from 8th of April 1931 and posted as Superintendent of the newly started Patonda Farm under this scheme.

3. Mr. N. L. Desai, Graduate Assistant, Dohad Farm, was transferred from Gujarat to this division and posted as Superintendent, Jalgaon Farm vice Mr. G. S. Moghe from 22nd May 1931. Mr. T. R. Khadilkar, Graduate Assistant, under the Economic Botanist, Poona was transferred to this Division and posted as District Agricultural Overseer, Erandol, from 5th April 1931.

II. Season.

4. The monsoon broke in the second week of June throughout all the districts, and the kharif sowings were over by the end of June 1930. The rains were favourable till nearly the end of July and the crop prospects excellent; but there was a drought in August in parts of West Khandesh and some eastern talukas of the Nasik district which marred the prospects to some extent and the standing crops of bajri, cotton and groundnut suffered more or less from want of sufficient moisture in these parts. Fortunately the drought was broken by heavy rains in September throughout the division and the crop prospects improved considerably. There were rains in October and November in all the districts and this gave good prospects for rabi sowings and the rabi area was more than normal. However the late rains in October and November spoiled the quality of cotton and the heavy rains of September caused much shedding of cotton bolls and lodging of the crop. Bajri crop suffered from September rains in several parts, due to washing away of pollen and lodging. The winter was mostly cloudy in Khandesh districts and hence there was less of cold and dew. This affected the wheat crop and the yield was reduced by nearly 50 per cent. Shalu jowar also suffered from want of sufficient cold and dew. The wheat crop in the Nasik district

was normal. On the whole the rains were favourable and the crops of bajri, groundnut and jowar came out fairly well. The Cotton crop suffered from heavy rains of September and the rains of October and November spoiled the quality of cotton and the yield was reduced by about 25 per cent. The rabi crops were spoiled by cloudy winter and the yields were below normal.

5. *Plant Pests and Diseases.*—The grape crop in the Nasik district was badly attacked by downy mildew and it proved practically a failure. The trouble was due to the fact that grape growers left off Bordeaux mixture spraying in favour of sulphur dusting which was cheaper and easier. Unfortunately sulphur dusting is not a preventive against downy mildew and cultivators were not impressed of this fact. To guard against this trouble in future, the Plant Pathologist to Government, Poona, is writing a leaflet on the subject and it will be distributed to the cultivators.

6. Irrigated wheats in Nasik district suffered badly from rust. It affected also dry wheats in western parts of the district. Damage by wingless grasshoppers was not appreciable during the year under report. Betelvine bug appeared this year also in Chandor taluka and dusting with calcium cyanamide, and lime and sulphur were tried and the damage was reduced from 70 to 40 per cent. Swarms of locusts passed over Khandesh and Nasik districts but no damage was done by them. On the requisition of the Kadwa Canal Irrigators' Association, Ozar, services of the Pig Killing Officer were made available in the month of January 1931 for 9 days. The shikar party killed 7 sows and 8 half grown pigs in 27 cartridges.

III. Research and Experimental Work.

7. *Cotton.*—Yield tests according to Fisher's method were carried out between Banilla and Farm N. R. at Dhulia and Jalgaon farms. At Dhulia the mean yield was 9.6 lbs. and 11.5 lbs. per guntha of Banilla and farm N. R. respectively and that at Jalgaon was 14.6 lbs. of Banilla and 11.3 lbs. of farm N. R. per guntha respectively. Unfortunately the results at Jalgaon were vitiated owing to the presence of wilt, so these are not absolutely reliable.

8. As compared with farm N. R., the Banilla cotton is more wilt resistant and in a comparative trial in a wilt affected plot on the Jalgaon Farm, the incidence of wilt attack on Banilla was 35 per cent. while that on farm N. R. was 51 per cent. The Verum No. 262, which was also compared in this plot, had an incidence of only 21 per cent. Almost all the roseum strains isolated for good yield and higher ginning were found more susceptible to wilt.

9. Several samples of Banilla from the district as well as from the Jalgaon farm were sent to the Technological Laboratory, Matunga for spinning tests and it was reported to be suitable generally for 15's and valued at Rs. 25 to Rs. 30 on Oomra.

10. *Selection in Roseum.*—Seven strains of roseum isolated in previous years were studied for botanical and other desirable characters and it was found that N.R. 6 fared well at Dhulia where there is no wilt trouble. At Jalgaon where there is wilt it was found that W. 19 and N.R. 144 did better. A strain selected from a variety of roseum brought from Berar gave promising results at Dhulia—its ginning outturn being 42 to 43 per cent.

11. *Selection in Bani.*—The progeny of Bani plants imported from the Nizam's Dominions were further studied and some plants of outstanding merits were isolated for further study.

12. *Wilt trials.*—With a view to isolate wilt resistant strains in the Neglectum and other types of cotton, a number of strains were tried on a wilt affected plot on the Jalgaon farm and several selections have been made for further study.

13. *Crosses.*—The study of crosses reported last year was continued and it is expected to obtain some promising material from these hybrids.

14. *Strain No. BXXI.*—This was compared with Banilla and N.R. on the Jalgaon farm and the yields of Banilla and BXXI were nearly equal. In spinning tests it spun up to 29's but was equally susceptible to wilt as the ordinary roseum. Its ginning percentage was 37 as against 39 of Banilla.

15. In the district the ginning outturn of Banilla continued high and during the year it was 39 per cent. as against 35 per cent. of ordinary N.R.

16. *Jalgaon Farm.*—The general cropping of the farm and the average yields of different crops obtained were as under :—

Name of crop		Area	Yield per acre	Remarks
		A. g.	Lbs.	
N.R. cotton	..	19 26	682	Cotton yield was comparatively less due to shedding and lodging caused by heavy rains in September, otherwise the season was very favourable.
Banilla cotton	..	106 23	603	
Groundnut	..	24 2	1,672	
Jowar and Udid	} mixed	21 0	1,302	
Wheat	..	16 10	96	
Gram	..	2 21	632	
			648	

17. *Manurial experiments.*—A number of experiments are being carried on the farm on all the crops, namely cotton, jowar, groundnut and wheat. The results obtained so far show that cotton crop responds significantly to the various treatments. The other crops do not appear to be so responsive. The experiments are in progress and the current year's results are given in the Experimental Report.

18. *Trial of new implements.*—The Agricultural Engineer sent a wheat drill for trial on the farm. This was tried on fairly large area ; but the germination was found defective as compared with that by the

local drill. Suggestions were made to the Agricultural Engineer to make suitable modifications. The Cooper's Engineering Works of Satara also sent a plough for trial which was similar to Ramsome's B.T.2 plough. It worked satisfactorily and was found suitable for medium deep ploughing to eradicate weeds like kunda and lavalā.

19. *Seed distribution.*—The quantities of different seeds distributed from the farm were as under :—

	lbs.
N.R. cotton	6,740
Banilla cotton	26,721
Groundnut pods	5,612
Groundnut kernels	624
Jowar	1,481
Wheat	2,880

20. *Implement Depot.*—The various implements as well as spare parts were kept in the depôt maintained on the farm as in past years for meeting the demand from cultivators. The total sale realised during the year under report was worth Rs. 500 for 11 Wiard ploughs and other spare parts.

21. *Nursery.*—The work at Dhulia and Khed was continued by the Horticultural Overseer. He gave practical instructions in budding and grafting to the students of the Vernacular Agricultural School, Dhulia. During the year 67 grafts from the famous Borsha mango tree were made and these were distributed in the district. 400 Dholka pomegranate plants were supplied to cultivators at Nashirabad in Jalgaon Taluka. The Overseer gave demonstrations in pruning, grafting, budding and other horticultural work in the division.

22. *Belgaon plot.*—The work on this plot could not be continued during the year as the Kamgar was posted on the Show plots of the Nasik District Show.

23. *Cattle Breeding Farm, Sangvi.*—This is the fourth year since the farm has been taken over from the Shirpur Association. The long felt want of the quarters for the Manager was removed by the construction of the quarters during the year. The strength of the herd on 31st March 1931 was as under :—

Cows	36
Female calves	24
Male calves	22
Breeding bulls	5
Work bullocks	6
Total	93

24. During the year three premium bulls were issued in Shirpur and Yawal talukas from the herd.

25. The general health of the herd was good—there being only nine deaths.

26. For supplying green fodder in hot weather, 63,000 lbs. of green fodder consisting of fodder jowar, maize and green grass was stored in a silo and the herd was fed on this ensilage in summer. Arrangements were made to grow green fodder on a large scale by putting a bund on the river, but unfortunately the bund was washed away by floods in the month of September and only half an acre of land could be put under lucerne. The bund has been repaired and arrangements would be made to cultivate 5 to 6 acres under irrigated fodder crops in the next season.

27. *Girna Canal plots.*—The agricultural work on the Girna Canal in the Nasik District was not well developed and it required some experimental work before improved methods of crop production could be spread among the cultivators. To meet this, an experimental plot of 15 acres was laid out at Aghar in Malegaon Taluka in a cultivator's land on condition that he will do all the farming of the plot according to the instructions given by the Agricultural Department and the Department will supply seeds, manures and water free. The land taken for this purpose was fallow and required cleaning. After ploughing it with a tractor, it was levelled up and laid out into 15 acres plots. Cotton, bajri, groundnut, wheat and tobacco were grown in these plots under different manurial treatments. As the land was brought under cultivation during the year only the results of the experiments were not encouraging. However, the yields of cotton and groundnut were fairly satisfactory. It is expected to give good results in the next season.

IV. Organisation.

28. *Taluka Development Associations.*—There were 22 Associations during the year and as usual they did very useful work. Appendix A gives their financial position and the activities carried on by them during the year.

29. These Associations engaged trained fieldman for the propaganda work and some of them have taken up the work of supervision of co-operative societies which is managed satisfactorily. The Jalgaon Taluka Development Association has obtained 421 acres of grazing land for a cattle breeding farm. The District Local Boards continued to give good support to these bodies. The Bhusaval and Raver Taluka Development Association erected their own buildings for offices and stores.

30. A conference of the Marathi-speaking Taluka Development Associations in the Bombay Presidency was organised by the District Agricultural Association, Jalgaon, on 8th and 9th October 1930, which was presided by the Honourable Mr. B. V. Jadhav, the then Minister of Agriculture. Out of 47 Marathi Taluka Development Associations, 35 sent their delegates and the Honourable Minister addressed the Conference in an inspiring speech and appreciated the work done by these Associations in Khandesh. 22 resolutions for the well-being of these bodies were moved and they are being suitably dealt with.

31. *Non-credit Co-operation.*—During the year a fruit sale society was organised in Raver Taluka which has been registered recently. The Jalgaon sale society did good work and the turnover of their transactions amounted to Rs. 1,75,957. The onion sale society at Kundewadi near Niphad is not prospering due to difficulties in recovering sale proceeds from moffusil agents and want of credit facilities from the Central Co-operative Bank of Nasik. The Nashirabad crop protection society did good work by protecting 10,000 acres of crops belonging to 900 cultivators at a cess of annas 5 per acre.

V. Propaganda.

32. *Banilla Cotton extension.*—An area of 10,720 acres was kept under control for purification and from this area the Department distributed 500,000 lbs. of cotton seed sufficient for nearly 25,000 acres through the Taluka Development Associations. The spread of this cotton was estimated at a lakh and a quarter acres producing nearly 30,000 bales. About 3,500 bales were produced from the area under control and most of these were purchased by the local mills at a premium varying from Rs. 5 to Rs. 10 per bale. The ginning outturn of Banilla was 39 per cent. as against 34 of the local and in point of yield it gave on an average 394 lbs. per acre as against 344 lbs. of the local in the district. The raw kapas used to bring a premium of Rs. 2 to 3 per maund or 168 lbs.

33. The prices of this cotton depend upon the purity of the crop; so to give proper training in maintaining the purity of this cotton a purification class was arranged on the Jalgaon farm which was attended by 42 students.

34. As this cotton has been appreciated by the cultivators and the trade, the Indian Central Cotton Committee sanctioned a grant of Rs. 54,000 for five years to organise a systematic pure seed supply and a special establishment has been maintained from this grant from the end of the year for this purpose. A seed farm of 100 acres at Patonda near Amalner has been started and it is proposed to extend it to 200 acres in future.

35. *N.R. and 1027 A.L.F. Seed distribution.*—8,000 lbs. of N.R. seed from the Jalgaon farm was distributed in the division and outside. The west of Nandurbar and Navapur talukas grows Herbaceum cotton and 1,200 lbs. of 1027 A.L.F. seed was distributed in this area from Surat.

36. *Akola Bajri.*—This bajri has continued to be popular in Khandesh and during the year 5,000 lbs. of it was distributed there from Sinnar in the Nasik District.

37. *Wheat.*—In irrigated areas Pusa 4 is getting popular due to its rust resisting character and arrangements for its distribution were made through the Taluka Development Associations. Every year fresh supply from Pusa is obtained to keep up the quality of this wheat. The strains

Nos. 162 and 168 supplied by the Crop Botanist did well in Shahada in West Khandesh and the cultivators are taking to them. Strains Nos. 808 and 809 did well in the Nasik District and village trials of these types will be arranged in the next season.

38. *Jowar*.—The Dagadi and Maldandi varieties continued to give good results and are spreading in West Khandesh as a rabi jowar.

39. *Sugarcane*.—J. 213 variety is replacing the local Khadya in the Nasik District. Demonstration plots for wider planting were arranged in Kalvan and Sakri talukas and the cultivators are adopting it. Demonstrations in improved gul boiling furnaces were arranged at three places in Kalvan Taluka. Manurial experiments were carried on in several places and the use of fertilisers for this crop is now mostly resorted to by the people.

40. *Manures*.—As a result of demonstration plots and shows the use of fertilisers has become mostly popular and private trade has sprung up in them. The Taluka Development Associations are also stocking them and the needs of the cultivators are met with in every possible way. Nearly 30,000 lbs. of fertilisers in the form of oil cake, sulphate of ammonia and nitrate of soda were supplied through the departmental agency. As a result of demonstration plots the use of mowra refuse from the Nasik Distillery has become popular and the Distillery realised Rs. 1,875 from its sale during the year as against Rs. 500 in the past year. Formerly it was unsalable but now keen demand has sprung up from the sugarcane growers in the Niphad Taluka for this manure.

41. *Agricultural work in the Bhil tract*.—The western talukas of the West Khandesh District are principally inhabited by Bhils who are an ignorant and backward class. A special Kamgar has been engaged since the last two years in this tract for demonstration work. During the year demonstrations in selection and storage of seed were made at 40 places. Demonstration plots of bansi wheat and maldandi jowar were arranged at four places and a demand for these seeds has been created. 300 sulphate of copper and sulphur packets were distributed for treatment against smut in jowar. Demonstrations in ploughing with Kirlosker No. 11 plough were arranged at six places. Top dressing of chillies and plantains with castor-cake was shown at several places. The services of the Kamgar have been fully utilised and every attempt is made to meet the agricultural wants of these poor people.

42. *Agricultural work in Dangs*.—The Kamgar at Ahwa continued to work under the direct supervision of the Dangs' Dewan and he got instructions from the Cotton Supervisor, Jalgaon, for his work. During the year he got constructed 173 new embankments for rice lands and 70 old ones were got repaired. 25 pits were made for demonstrating the proper preservation of farm yard manure. He also demonstrated the proper method of hay making and stocked 660,000 bundles of such hay. A rat killing campaign by arsenic poison was carried out by him and he assisted the cultivators in every possible way.

43. *Power chaffcutter*.—This was demonstrated at five places in Jalgaon and Erandol talukas and 24,750 bundles of kadbi weighing approximately 298,000 lbs. was chaffed.* The hire charges realised were Rs. 30-15-0 as against Rs. 11-11-0 of last year.

44. *Tractor work*.—The area ploughed on hire was 148 acres and the amount of hire realised was Rs. 888. Besides this 15 acres were ploughed as a demonstration. There was a breakage in the tractor at the Nasik show. So it was idle for nearly four months.

45. *Trial of implements*.—The winnowing machine of Mr. Schutte was tried at four places in Erandol Taluka for jowar and it was found superior to that of Messrs. Kirloskers. The output was 1,000 lbs. of grain per hour and there was no dust or earth in the grain. The trial of hay rake for collection of cotton stalks and jowar stubbles after harrowing was carried on during the year at eleven places and it was found economic for this work. It would be demonstrated on an extensive scale next year.

46. *Implement Depots*.—During the year ten departmental depots were maintained for hiring out suitable implements to cultivators. These are worked where there are no Taluka Development Associations and they continue to be popular. During the year Rs. 740-15-3 were realised as hire charges from these depots.

47. *Crop protection*.—The trouble from wingless grasshoppers in the Chandor Taluka was not serious during the year. However tin sheet and bagging operations were organised at three places where they were more in abundance. On requisition from the Kadwa Canal Irrigators' Association, Ozar, the services of the Pig Killing Officer, Poona, were made available for pig hunting in the sugarcane area of the Association in January and he killed about 15 pigs in a campaign of six days. The Raver Taluka Development Association conducted a pig killing campaign and killed 77 pigs during the year. The Kanagar in the Dangs conducted a rat killing campaign by arsenic poison.

48. *Propaganda against Smut*.—As usual this was carried on at nearly 250 places and 6,000 packets of sulphate of copper and sulphur dust were distributed in the district.

49. *Siloes*.—The District Agricultural Overseer, Nasik, arranged demonstration siloes in Igatpuri, Nasik and Peint talukas where plenty of green grass is available in the rainy season. The people realise the value of this fodder for the hot weather, but they do not take to it readily as cash money is required in cutting grass and digging pits. It is proposed to demonstrate these siloes again in the coming season on an extensive scale.

50. *Demonstrations*.—The district staff arranged 209 demonstration plots to show advantages of wider sowing in cotton, sugarcane and bajri, use of fertilisers for different crops and varietal comparison of bajri, cotton, wheat and sugarcane. Besides this, magic lantern shows, jowar steeping, implement working and other demonstrations were arranged

at several places and the following statement gives the idea of the various activities conducted in the division :—

Serial No.	Nature of demonstration	No. of places	Attendance
1	Crop demonstrations	66	750
2	Implement demonstrations	76	1,550
3	Power chaffcutter	4	250
4	Tractor demonstrations	6	570
5	Gul boiling and improved furnace	3	125
6	Jamabandi demonstrations	17	3,000
7	Jowar steeping demonstrations	270	5,500
8	Magic lantern shows	42	8,500
9	Miscellaneous	22	3,740

51. *Nasik District Show.*—Mr. R. G. Gordon, the Collector of Nasik District, initiated the idea of holding a district show in 1928 and he formed a District Show Committee with the late lamented Rao Saheb K. M. Pawar and Sirdar Vinchurker as Secretaries of the Committee. About Rs. 25,000 were collected by contribution from the general public of the district. During the years 1928 and 1929, the Show had to be postponed due to plague and bad season, after preliminary arrangements had been made for laying out the crop court every year. During the year under report the Show was brought to a successful conclusion. The Show was planned on similar lines as those of the Poona and Ahmedabad Presidency Shows and a crop court was laid down where different crops were grown under different treatments. It was kept open for about a week and nearly 40,000 people visited the Show from all over the district. In all Rs. 16,000 were spent after the Show and the Show Committee has been left a balance of about Rs. 9,000 with them. The credit of bringing the Show to a success issue is due to the efforts of the Collector Mr. Gordon and the Secretaries, late Rao Saheb Pawar and Sirdar Vinchurker.

VI. *Agricultural Service.*

52. *Boring.*—Due to financial stringency the boring work was closed from 1st November 1930. Machine No. 19 was however kept in working with special permission of the Director of Agriculture in Raver Taluka, the owner undertaking to bear all working cost. Ten new bores were made during the year of which eight were unsuccessful or abandoned by the owners and only one at Balwadi in Raver Taluka was successful and one is in progress. The total footage bored was 653' 11." The statement showing details of different bores is given in Appendix B.

53. *Mechanical help.*—The Mechanical Assistant erected one pumping plant at Dhurkheda in Shahada Taluka and made site surveys and estimates for five pumping plants in the division. Besides this he looked to the boring work after it was closed due to retrenchment. He

was in charge of the tractor and carried out the mechanical supervision of the power chaffcutter and other farm machinery in the division.

54. *Field embankments.*—The Bunding Officer investigated 36 new schemes and prepared estimates for their execution. 21 schemes were recommended for grant of land improvement loans. In the month of September he was deputed to South Central Division for looking into the bunding work done there. From October to December he was given work in connection with the Nasik District Show.

VII. Agricultural Education.

55. *The Vernacular Agricultural School at Dhulia.*—The total number of the students during the year was 32 of which 17 were in the first year and 15 in the second year. According to the caste, 19 were Marathas and 13 were backward Hindus. According to the districts, 17 came from East Khandesh, 6 from West Khandesh and 9 from Nasik.

56. The annual examination was conducted by Messrs. R. Y. Halkoti, the Inspector of Agricultural Schools and B. K. Vaishampayan, Graduate Assistant, Amalner. Out of 17 students in the first year 15 passed out fully and 2 were promoted on the recommendations of the examiners. All the 15 students in the second year came out successful.

57. The expenses on account of boarding of the students were met with from subscriptions from the local bodies in the division and the amount thus collected came to Rs. 2,550. The students were given scholarships at the rate of Rs. 8 per mensem each for meeting their boarding charges and it is gratifying to note that the boarding charges averaged to Rs. 7 only per mensem, and the guardians of the boys had not to bear any expenses on this account.

58. The Local Agricultural School Committee continued to manage the contributions collected for the boarding of the boys and assisted the school in its management in various ways according to their resources.

VIII. Publicity.

59. The staff contributed several articles in the "Shetki and Shetkari" and the "Agricultural College Magazine." Almost all local Taluka Development Associations issued their reports giving results of their experiments and work done for the information of the public.

IX. Miscellaneous.

60. *Dhulia Cotton Market.*—During the year the regulated Dhulia Cotton Market was organised as per Cotton Market Act of 1927 passed by the Government of Bombay and it came into working from 1st December 1930. There was some opposition from the trade in the beginning but it was won over and it worked satisfactorily. The total amount received as cart and registration fees came to Rs. 7,255. The credit for the successful working of the market is due to Mr. S. H. Prayag, Cotton Breeder, Dhulia, who worked as Chairman of the Market

Committee formed under the Act. By his tact and sociability he won over all opposition and worked very hard to make the market a success.

61. *General.*—The energy of the staff was severely taxed in managing the Nasik Show which was a big success and the staff worked to their full capacity. The burden of maintaining the account of the Show fell on the office establishment of the Deputy Director of Agriculture, N. C. Division, Nasik, and they managed it very creditably. Special mention should be made here of Mr. J. N. Purandare, the Bunding Officer, and Mr. N. B. Limaye, the Head Clerk, who had to put in very hard work in the management of the Show.

62. *Personal.*—During the year the Department lost the services of Rao Saheb K. M. Pawar, the permanent Deputy Director of Agriculture of the division, by premature death. His loss is irreparable and mourned by all concerned. After the death of Rao Saheb Pawar the Division was run by Mr. N. V. Bhagvat, the Cotton Supervisor, Jalgaon, who worked in addition to his own duties and had to put in very hard work in bringing the Banilla Expansion Scheme into operation.

C. S. PATEL,

Deputy Director of Agriculture,
N. C. D., Nasik.

APPENDIX A.

Statement showing information about the Taluka Development Association in the North-Central Division (amounts collected and main items of expenditure), for the year 1930-31.

Name of (Taluka Development) Association	Amount collected	Government subsidy	Amounts spent					No. of Plots arranged	No. of Demonstrations held
			Establishment and office	Implements, etc.	Manures, seeds, etc.	Demonstrations	Other charges		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Nasik District									
Nasik ..	848	706	1,127	..	36	26	11	10	3
Malegaon ..	2,626	647	994	172	144	34	165	58	8
Satana ..	3,128	1,000	1,089	230	84	39	..	52	..
Yeola ..	1,394	1,000	825	524	2	12	83	6	1
Kadwa Canal ..	906	878	947	1	21	11	171	25	..
East Khandesh									
Amalner ..	894	427	740	2	88	1	55	35	12
Bhusaval ..	2,184	1,000	2,732	223	..	119	34	54	68
Chalisgaon ..	1,656	1,000	1,695	850	289	66	182	54	..
Chopda ..	1,201	488	1,064	250	314	26	1	15	24
Edulabad ..	Information not available				..	..	..	64	45
Erandole ..	1,189	604	1,580	..	124	33	37	19	15
Jalgaon ..	3,619	1,000	5,540	38	311	47	34	120	39
Pachora ..	1,363	1,000	3,422	..	141	..	19	44	23
Raver ..	2,443	1,000	2,811	48	206	87	..	96	21
Yaval ..	Information not available				..	..	..	..	..
West Khandesh									
Dhulia ..	1,130	1,000	2,772	203	214	356	341	23	4
Nandurbar ..	1,153	1,000	1,084	190	215	274	860	24	62
Shahada ..	576	574	1,128	..	162	56	30	..	..
Sindheda ..	3,119	553	1,783	..	118	11	..	117	..
Shirpur ..	1,127	653	1,578	99	124	38	247	46	33
Taloda ..	980	636	689	1	27	33	452	53	..
Sakree ..	2,401	1,000	1,368	187	217	91	179	..	..

APPENDIX E.

APPENDIX

Annual Report of Boring Work done during the year 1930-31, ending

1	2	3	4	5	6	7	8	9	10	11	12
Serial Number of bores	Names of the well owners	Survey Number	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of well	Diameter of bore	Depth of actual bore	Water before boring in gallons per hour	Water after boring in gallons per hour	No. of gallons increased per hour by boring	Labour charges
<i>Boring Machine No. 11</i>											
1	Mr. A. C. Owen	Nil.	Nasik	Nasik	Well 60' x 12'	3"	118'	Not known	Not known	Nil.	Rs. 120
2	Mr. Salphai...	"	Nasik	Deolali	Well 60' x 12'	3"	43'-6"	"	"	"	55
<i>Boring Machine No. 24</i>											
1	Mr. Jamnadas Ranchoddas.	"	Jalgaon.	Jalgaon.	Well 50' x 10'	3"	4'-5"	"	"	"	30
<i>Boring Machine No. 19</i>											
1	Mrs. Anandibai Deshmukh.	209	Raver	Savda	Well 60' x 9'	3"	106'-0"	100 galls.	100 galls.	Nil.	120
2	" "	209	"	"	"	3"	75'	"	"	"	48
3	" "	278	"	"	Well 50' x 9'	3"	20'	75 galls.	75 galls.	"	60
4	" "	278	"	"	Well 50' x 9'	3"	10'	"	"	"	24
5	Mr. G. D. Pardehi.	68	"	Kochur	Well 50' x 9'	3"	152'	600 galls.	600 galls.	"	113
6	Mr. Nana Motiram Patil.	112	"	Balvadi.	Well 70' x 18'	3"	125'	12000 galls.	14000 galls.	2,000	62
7	"	"	"	"	"	"	"	14,000	The work of	this	

APPENDIX D.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, SOUTH CENTRAL DIVISION, POONA,
FOR THE YEAR 1930-31.*Staff.*

I continued to remain in charge of the Division throughout the year. Attempts for the appointment of an Agricultural officer to represent agriculture on the Local Advisory Committee of the Railways have resulted in the nomination in April 1931 by Government of Rao Saheb B. P. Vagholkar, L. Ag., Deputy Director of Agriculture, South Central Division, Poona, to represent agriculture on the Local Advisory Committee of the G. I. P. Railway, Bombay, (*vide* Government Public Works Department letter No. 2907/27-Ry., dated 18th April 1931) and accordingly I attended the Railway Committee's meeting, for the first time in May 1931. I was also appointed by Government as a Member of the Irrigation Conference held at Poona on 27th and 28th March and 29th June 1931 and subsequent days.

The changes in the staff were as under :—

Mr. T. S. Swadi, Superintendent, Manjri Farm, was on leave twice viz. for one month in July and for 2½ months till March 1931; in March 1931 he was posted for the work of site selection for Sugarcane Research Station on the Nira Right Bank Canal. During the above periods, Mr. N. B. Patwardhan, B. Ag., held charge of the Manjri Farm; and the services of Mr. V. S. Abhyankar, B. Ag., were secured for laboratory work on the Manjri Farm during the busy season, viz. from middle of December till the end of March 1931.

Owing to transfer from this Division of Mr. A. R. Nikam, under the Professor of Agriculture, Poona, in November 1930, Mr. S. T. Sathe, Non-Graduate Assistant, came to this Division.

Mr. T. N. Chaugule, Head Master, Vernacular Agricultural School, was on leave for three months from 6th December 1930; and Mr. S. S. Khot, B. Ag., acted for him.

Mr. C. A. Borudey, Superintendent, Kopargaon Farm, was on leave in December 1930 for three weeks and Mr. K. D. Khole, Non-Graduate Assistant, acted for him.

The period of Mr. R. D. Khandekar on deputation in foreign service under the Shikshan Prasarak Mandal, Rajapur, has been extended till the end of March 1932, and Mr. P. S. Kulkarni continued to work on the Manjri Farm as an acting Graduate Assistant.

The year was an abnormal year for special works in this Division, which had to be coped with, in addition to the usual routine work, which is also equally expanding and requires constant attention in the districts. The following list shows the important visits of several committees

and personal attendance on some, for whom notes were required to be prepared :—

(1) Visit of Sugar Sub-Committee of the Imperial Council of Agricultural Research to Manjri Farm and the special meeting to discuss the sugarcane research scheme for the Bombay Deccan.

(2) Visit of Indian Tariff Board Members on the Sugar Industry to Manjri Farm and the meeting in Poona to hear evidence of the Irrigators' Association on Canals.

(3) Personal attendance at—

(i) Bombay Provincial Agricultural Research Council to explain the sugarcane research scheme of the Bombay Deccan.

(ii) Indian Tariff Board on Sugar Industry sittings in Bombay to give evidence with the Director of Agriculture.

(iii) The Irrigation Conference held in March and June 1931, where the question of policy on Deccan Canals was discussed.

(4) Preparation of detailed scheme for Sugarcane Research Station and consequent selection of site for the Station.

(5) Preparation of a scheme for Borstal School at Visapur at the request of Inspector General of Prisons, Bombay Presidency, Poona.

These special items kept the canal, district and Manjri Farm staff engaged for a greater period of the year and also the office staff had to work without any additional staff.

Nagar and Sholapur Districts, dry tracts have been receiving full attention as per recommendation 73, Chapter IV, by the appointment of temporary staff since 1929. The work with the help of local organisations is developing and the propaganda is extending in the interior. This staff requires to be continued until permanent staff is sanctioned. This naturally compels the Deputy Director to be on tour constantly.

Similarly the Nira Right Bank Canal is equally receiving attention where the loss of Government is somewhere about 30 lakhs annually. With the minimum temporary staff, made available since 1928, consisting of one graduate assistant, and two temporary kamgars on Rs. 30 per mensem each, the work is progressing. But more temporary staff at least for a period of five years seems essential to develop this canal. At the Irrigation conference, proposals inclusive of staff with annual expenditure amounting to Rs. 18,400 were submitted. Government in their Government Resolution, No. 2353/27, dated 26th January 1931, Public Works Department, granted concessions in regard to water rates and other matters; and the Irrigation Conference has recommended concessions to areas outside blocks. These are going to cost deficit to Government by some lakhs annually for three years. In view of it, the provision of the amount specified would help the Irrigators to avail of the concessions, without which, development and utility of concessions granted would not be visible within the period mentioned.

For this Division, from Sir Sassoon David Trust Fund, the following agricultural machinery is purchased and arranged to be demonstrated as well as to be given on hire to cultivators.

- (1) Case Tractor, cost Rs. 3,300.
- (2) Power Chaff-cutter, Rs. 1,616.

Retrenchment.

Owing to retrenchment, Boring Section was closed from 1st September 1930 and the Baramati Farm discontinued from June 1931. The Institution of Loni Agricultural School, which has been working since last 20 years, has been an item of retrenchment for its being closed from 1932 after completing the course of 2nd year boys.

Season.

For canals, the season on the whole was favourable. The rains were excessive on Godavari Canals when compared to past twenty years. In famine tracts, the rains were normal but abnormal nature of winter prevented a normal yield.

Economic conditions of cultivators in dry and Irrigated tracts.—Owing to the prices of agricultural produce going down to 66 to 25 per cent. of the prices in 1929-30 and labour wages remaining the same till May 1931, cultivators and their financiers have been badly hit. In dry tract and canal, the cultivator having minimum amount in hand could not pay even the dues for current expenditure borrowed in the previous year. In canal tract every money crop requires finance and crop like Cane requires heavy finance. As the recoveries were short, new finances have been restricted. Hence, the area under all money crops would be reduced this year and it will be much more reduced next year under Cane.

In dry tract, it has been noticed that bullocks and calves had to be disposed off to pay dues. Hire received for plows by implement societies in Nagar District, which used to be about Rs. 2,307 is now Rs. 733, is one of the indications showing deficiency of bullocks with cultivators.

If the prices continue to be the same, the development of new canal, like Nira Right Bank would take a longer period than what is expected. It is very likely that there would be reversion of rural population from cities to villages owing to industries not working fully. The reverted rural population is likely to go in for farming. If such excess rural population intends to settle on the Nira Right Bank Canal, in the early stages, some arrangements will have to be devised to finance these men by the Co-operative Institutions and Government.

With the present prices continuing for a period of some years the owner-cultivators would try to arrange to balance their budget; but the question of debt repayment within a specified time would be a difficult one. This question would require attention of economist.

Lines of Work.

The operations of this Division are summarised under the same following heads as it was done last year to facilitate references and comparisons where needed:—

- (I) Research.
- (II) Propaganda.
- (III) Agricultural Organisations—
 - (A) Taluka Development Associations, and
 - (B) Non-Credit Co-operative Societies.
- (IV) Agricultural Services—
 - (A) Boring Operations.
 - (B) Engineering Advice and Assistance.
 - (C) Pig Killing Operations.
 - (D) Field Embankments.
- (V) Agricultural Education.
- (VI) Departmental Administration.

Section I.

RESEARCH.

Manjri Farm.—The season, on the whole, was better for Cane when compared to previous year. The average yield of gul was 10,544 lbs. as against 10,188 lbs. in the previous year. The experiments which are showing interesting results are summarised below :—

Nitrogenous Top-dressing Reduction Series.—The three years' cycle of this experiment has been complete and the results are summarised below :—

Serial No.	Treatment	Weight of cane per acre (average of 4 replicates)		
		1928-29	1929-30	1930-31
		Lbs.	Lbs.	Lbs.
1	Farm Yard Manure, 30 cart-loads + 75 lbs. N.	89,713	98,866	68,416
2	Farm Yard Manure, 30 cart-loads + 112½ lbs. N.	96,380	102,775	75,692
3	Farm Yard Manure, 30 cart-loads + 150 lbs. N.	101,051	100,457	83,350
		Weight of gul per acre (average of 4 replicates)		
1	Farm Yard Manure, 30 cart-loads + 75 lbs. N.	11,277	12,683	8,797
2	Farm Yard Manure, 30 cart-loads + 112½ lbs. N.	11,649	13,035	9,474
3	Farm Yard Manure, 30 cart-loads + 150 lbs. N.	12,320	12,591	10,816

This experiment was conducted in replicates as per Fisher's method and results obtained are not significant. However, some general conclusions like the following can be drawn :—

(1) 150 lbs. N. top-dressing is the most economic dose.

(2) In new lands like the one where this experiment was conducted with a slightly less dose than 150 lbs. N., higher yields could be secured. These would require further corroboration for at least two to three cycles, without which these could not be accepted as final.

Farm Yard Manure Reduction Series.—(Reduction of Farm Yard Manure quantities than 30 cart-loads.) This is the second year of this experiment and the results would be summarised after the cycle is complete.

Selection of Profitable Varieties.

(a) *Intermediate Trials.*—Ten varieties were tried on a small scale to see which respond well. Amongst these, E.K.28, H. 109, and C.O. 290 have yielded more than 40 pallas yield of gul per acre and E.K. 28 and C.O. 290 are found to be earlier in ripening which could be harvested within 13 months.

(b) *Large Scale Varietal Trials.*—Four varieties, H.M. 89, J.213, P.O.J. 2878 and Striped D. 109 were tried in comparison with Pundia. The following statement summarises the yield obtained in 1930-31 :—

Name of variety	Weight of cane	Weight of juice	Weight of gul	Weight of gul in pallas	Extraction	Brix
	Lbs.	Lbs.	Lbs.		Per cent.	
H.M. 89 ..	78,147	50,353	10,707	44.6	64.4	22.0
J. 213 ..	81,270	52,460	9,698	40.4	64.5	20.48
P.O.J. 2878 ..	86,174	56,663	11,204	46.6	65.3	21.79
Striped D. 109 ..	85,581	57,845	10,739	44.7	67.4	19.50
Pundia ..	81,298	57,778	10,821	45.0	71.1	19.86

Striped D.109 and H.M. 89 have shown equally good results ; similarly, P.O.J. 2878. But, this is the first year. This variety has been found to be early which could be harvested within 12 months. Further trials seem essential to corroborate the observations recorded.

(c) *New Varieties and Selection of Canes from Coimbatore suitable for Deccan Tract.*—The following selections and varieties have been received for trial and more are promised next year from the Cane Breeder, Coimbatore :—

Selections.—C.O. 358, 360, 361, 362, 363, 364 and 365.

Varieties.—P.O.J. 2725 and B. 6308.

Sugarcane Breeding.—In order to study at Manjri Farm, whether the climatic conditions are favourable for cross-pollination, Mr. N. B. Patwardhan, B.Ag., who was deputed to Coimbatore to study the matter, recorded in 1929-30 observations regarding the percentage of open anthers

in different varieties. This data was utilised in 1930-31 flowering season for effecting certain crosses. The hybridization was carried on from second week of November to close of November. The general weather conditions during the period were favourable, i.e. cloudy weather accompanied with drizzles. The anthers were found to dehisce between 6-30 to 7-45 a.m. on cloudy days and 7-30 to 8 a.m. on fair weather days. The arrows were collected in second and third week of December and after completely drying, these were sown in January 1931. Below are given the number of seedlings obtained from different crosses:—

	No. of seedlings
P.O.J. 2878 × <i>Saccharum spontaneum</i>	223
P.O.J. 2878 × Sealy seedling	123
P.O.J. 2878 × Striped D. 109	6

The second Cane Breeding Officer, Coimbatore, when he visited the Manjri Farm has taken some material for trial at Coimbatore.

Visitors.—The Farm was visited by the Honourable Dewan Bahadur S. T. Kambli, Minister for Agriculture, on 10th December 1930 and he expressed satisfaction.

Baramati Farm.—The season, on the whole, was far defective and consequently affected the yield of all crops. The total rain was only 13·55" and that too two-thirds fell in September, as against 20·23" in the previous year. The average yield of gul per acre was only 9,950 lbs. as against 10,899 lbs. in the previous year.

Nitrogenous Top-dressing Experiments.—150 lbs. N. dose of top-dressing which was found to be economical in comparison with 200 and 250 lbs. was reduced since 1928-29—further to see whether further reduction is feasible. In comparison with 150 lbs. N. dose trials with 100 lbs. and 125 lbs. and 75 lbs. N. were made. The average results for three years have shown that—

(1) 150 lbs. N. dose has given the highest economic yield over the rest;

(2) between 100 and 125 lbs. N. doses, no appreciable increased difference could be seen in the yield, and

(3) the yields with 75 lbs. N. are comparatively low.

Varietal Trial of Cane.—The varieties H.M. 544, D. 109, J. 213 and B. 1528 were tried since 1928-29 in comparison with *Pundia*. The results have shown that *Pundia* stands first and D. 109 second.

Owing to retrenchment, Baramati Farm has been discontinued pending financial conditions improve.

Kopargaon Farm.—The total rainfall during the season was 28·42 inches as against the average of 18·96 inches of 16 years. Besides, it was well distributed over a longer period specially in the months of June, July, September, October and November. The average yield, per acre, obtained was 12,534 lbs. gul of Plant cane and 7,669 lbs. gul of Ratoon cane as against lbs. 12,889 and lbs. 9,583 in 1929-30 and lbs. 11,426 and lbs. 9,765 average yields of past four years.

Trials of Cane Varieties.—Since the year 1929-30, a change has been made in the treatment, i.e. manure dose of top-dressing, the total quantity of Nitrogen which was lbs. 200 has been reduced to 150 lbs. both for Plant and Ratoon. The results of two years Plant cane and one year Ratoon show still the superiority of Pundia and D. 109 in yield over the rest of the varieties. In spite of low dose of 150 lbs. N. these varieties have yielded 12,220 lbs. and 11,525 lbs. gul per acre (average for two years) for Plant cane. These varieties yielded on an average for three years previous to 1929-30 with 200 lbs. N. top-dressing lbs. 11,131 and lbs. 10,710 gul per acre for Plant cane.

Nitrogenous Top-dressing Dose.—As reported in last year's report, the dose of lbs. 200 N. in the form of top-dressing was an economic one as compared with higher doses up to lbs. 350. The yields obtained on an average for three years of Plant and Ratoon cane with 200 lbs. N. were 11,393 lbs. and 10,183 lbs. as against lbs. 11,698 and lbs. 9,792 with 350 lbs. N. top-dressing dose. As a result of this experiment, a new experiment has been planned since 1929-30 to see whether the dose of top-dressing could still further be reduced and the quantities tried with 200 lbs. N. were 150 lbs. N. and 100 lbs. N.

From the results available for Plant cane for two years and Ratoon for one year, appreciable difference between the treatment is not yet visible with the lowering of quantities of N. top-dressings.

Adsali Cane-growing.—Recently on canals, the practice of planting cane from June to October, which usually comes for harvest after 16 to 18 months, is being adopted by a large number of cultivators to get more yield and obtain better prices. This planting is known as "Adsali" i.e. coming out of season. The Department has no data as regards harvest etc. and hence the experiment has been introduced since 1929. The crop has been found to have yielded after 17½ months 13,566 lbs. of gul (date of planting, 4th July 1929; date of harvest, 17th December 1930). It is too early to draw conclusions and hence the experiment is being continued.

Mohol Plot.—This was again a year when Kharif rains were defective and hence cotton could not be sown. Jowar was sown by the end of September. In spite of normal rainfall, the yield of Jowar has suffered owing to Sugary disease on Jowar. The average yield obtained on the Farm was 388 lbs. grain and 935 lbs. Karbi as against 406 lbs. and 897 lbs. in the previous year.

The experiment of grading vs. non-graded seed of Jowar was continued and the yields have shown superiority of graded seed. The yields obtained are 420 lbs. grain and 1,720 lbs. Kadabi per acre from graded seed as against 280 lbs. grain and 1,384 lbs. Karbi from non-graded.

Experiments conducted by the Soil Physicist and the Plant Pathologist would be reported by them separately.

Rabi Jowar Breeding.—The work on the selection of high yielding strains in the two varieties—Maldandi and Dagadi—has been started as

reported in the last year's report. Five selections in Maldandi, which showed superiority in line-culture test last year, were tried on a large scale in four replications according to Fisher's "Randomized block method". Side by side, a few good cultures are being studied for characters, such as growth, quality, etc. In samples collected from Nagar and Bijapur of Dagadi, a number of selections have been made for further testing.

Section II.

PROPAGANDA.

The principle items of the programme of the district staff are as under :—

(A) *The Popularisation of the Copper Sulphate Treatment for Jowar.*—The following shows the total distribution of copper sulphate packets distributed, district by district :—

Name of District	No. of packets distributed in 1930-31
(1) Ahmednagar	2,712
(2) Sholapur	2,281
(3) Satara	782
(4) Poona	508
(5) Canal area (including Nira Right Bank Canal) ..	1,360
Total ..	7,643

In addition to copper sulphate, sulphur dust packets, about 1,000, have been distributed in Nagar and Satara Districts. Besides, Jowar seed of cultivators sufficient for 2,924 acres was steeped and supplied for sowing.

(B) *Introduction of New Crops and Varieties.*

(i) *Introduction of Cane Varieties in the Canal Area*—(a) *H.M. 544 Cane Variety.*—The area under this variety has been 78 acres and 10 gunthas as against 57 acres. It has been retained by some cultivators, who found them suitable to their soil and other requirements. The trials in the year, in comparison with Pundia, have given the following yields on the three canals :—

Name of Canal	Yield of gul per acre in pounds of	
	H.M. 544 (plant)	Pundia (plant)
Nira Left Bank Canal	11,875	10,726
Godavari Canals	11,004	11,570
Pravara Canals	6,222	11,856

This variety, as will be found from previous reports, has been tried since last seven years on all the canals and the average results obtained for several plots will give an idea as regards its behaviour in comparison with Pundia. These are tabulated below :—

Name of Canal	Period of trial (years)	Yield of gul per acre (plant cane)		Remarks
		H.M. 544	Pundia	
		Lbs.	Lbs.	
Nira Left Bank Canal	7	12,130	11,537	The yields are averaged from several plots under trial.
Godavari Canals ..	4	9,260	9,482	
Pravara Canals ..	5	8,951	10,343	

On Nira Right Bank Canal, 25,000 sets of this variety have been distributed.

(b) *J. 213 Cane Variety*.—Another economic variety J. 213 was being tried on canals in comparison with Pundia to see how it responds under different conditions of soil and climate. The results obtained are tabulated below :—

Name of Canal	Average yield of gul per acre of	
	J. 213	Pundia
	Lbs.	Lbs.
Nira Left Bank Canal	8,623	10,134
Godavari Canals	11,400	10,120
Pravara Canals	5,320	9,000

This is the first year of trial and conclusions cannot be drawn. It seems to be an economic variety, which can be grown by cane growers who have power-crushers, as it could be harvested within 12 months. Even though it may yield equally good yields like Pundia, the extension is likely to be limited to less extraction per cent. on bullock power mills and consequently uneconomic to rabi men.

(ii) *Introduction of N. R. Cotton on Canal Area in Nagar and Sholapur Districts*.—The year was a bad one for cotton owing to exceptionally heavy falls in September which affected the cotton yield. The average yields obtained on different canals were as under :—

Name of Canal	Yield of seed-cotton per acre
Nira Left Bank Canal	750
Godavari Canals	500
Pravara Canals	450
Nira Right Bank Canal	400

27,000 lbs. N. R. seed was distributed and the area under cotton stood as under :—

Name of Canal	Area under cotton	
	Acres	
Nira Left Bank Canal	..	5,277
Godavari Canal	..	4,500
Pravara Canal	..	4,200
Nira Right Bank Canal	..	1,200

In Sholapur District the average yield obtained of N. R. 451 lbs. of seed cotton under well-irrigation and in Nagar District, as a dry crop, the yield was 351 lbs. The yields have been low. In these two districts 26,200 lbs. N.R. seed was distributed.

(iii) *Introduction of Groundnut Varieties.*—Propaganda in this Division does not seem essential as natural spread is taking place wherever the crop has scope and the cultivators try to obtain seed locally. On Nira Right Bank Canal, Spanish Peanut seed has been distributed at concession rate.

(iv) *Introduction and Dissemination of Akola Bajri.*—5,831 lbs. of Akola Bajri seed was exported from Nagar District for the cultivators. The importance of high yield of Akola Bajri over local is now too well known and local cultivators are found to use the seed for two years and then order fresh seed in the third year.

(v) *Introduction of Pusa-4 Wheat and Tobacco on Canal Area.*—Pusa-4 wheat has well spread on the canal area and it is found it has substituted $\frac{3}{4}$ th area under Khapli. Good cane-growers have been found preserving seed and making it available to other cultivators.

Tobacco has not yet taken deep root. Adcock and Nipani varieties were given trial and the yield was found to be equal.

(C) *Introduction of Improved Methods in Sugarcane-growing (Canal Area).*—As a result of propaganda for the last so many years, wide method of planting has been universally adopted. Reduction of Nitrogen doses in the form of top-dressing is being adopted owing to economic conditions of cane-growers. The propaganda of sanne, as a green manure, has commenced to appeal and as a result of it, nearly 15,577 lbs. San seed has been distributed. Special concessions for San growing in block and non-block area have been secured from Irrigation Department and this will naturally compel a greater acreage under same in the near future. On Nira Right Bank, arrangements are being made to distribute the seed at concession rate.

(D) *Modified Java Method of Planting Cane.*—The area under this method during the year on different canals was as under :—

Name of Canal	Area	
	A.	g.
Godavari Canals	31	20
Pravara Canals	7	0
Nira Left Bank Canal	5	0

This item of propaganda will be given up from next year.

(E) *Spraying and Fumigation Operations*.—As a result of demonstrations of spraying on crops like potatoes, lucerne, grapes etc. and fumigation for the last so many years, cultivators have been realising the importance and are seeking help from the Department. In Poona District, at Khed and Saswad, spraying for Tambera disease on potatoes was done by cultivators over an area of 25 acres and 18,000 lbs. potatoes were fumigated. On canal and Nagar District spraying grapes, lucerne etc. is being adopted by many cultivators.

(F) *Horticultural Operations*.—There has been a keen demand in this section for advice. In Satara, Bor budding was done in large number in seven villages and 140 grafts of mangoes were supplied. Pruning of grapes was demonstrated in six villages. In Poona, 300 fig trees were treated against Rust disease and several trees in Mosambi gardens were treated for Gumosis disease with success. On the canals, pruning of grapes at right time was demonstrated, and several trees were treated for Gumosis. The area under fruit trees on canals is increasing. As reported in last year's report, there seems a sheer necessity of a special man to help the cultivators in fruit growing on the canal area.

(G) *Implement Depots*.—There were 24 depots and the total hire received, both from plows, ridgers and crushers, amounted to Rs. 1,137.

(H) *Shows and Demonstrations*.—The agricultural propaganda is conducted through the following methods:—

(1) Organised shows, (2) demonstrations of implements, manures, new varieties of crops, steeping and spraying as a means to prevent diseases of crops, (3) Jamabandi demonstrations, (4) organisation of depots of implements and manures and manures and seed societies for purchase and sale of cultivators' produce and (5) demonstrations of agricultural improvements through co-operative credit societies.

During the year, no district show was held; but, the taluka shows held at Bhilawadi or Oudumbar and Shirala by Taluka Development Associations were helped by the Department. These were largely attended by cultivators.

Items 2, 3 and 4 mentioned above.—Two and three have been reported separately in the summary of work of each district, while information in respect of 4 is given under the work of non-credit societies mentioned in section III of this report.

(I) *Demonstration of Agricultural Improvements through Credit Societies*.—As recommended by Royal Commission on Agriculture, in Chapter V, Recommendation 29—"The Agricultural Department should make greater use of co-operative credit societies in their propaganda work"—the work has been attempted since 1929 as reported in previous year's report at some centres in this Division. With some co-operative credit societies the work does show signs of success; but patience would be essential to watch the results. The district staff did experience difficulties and these are being

overcome as the experience is obtained. The work done is summarised below :—

District	Name of the Co-operative Credit Society	Work done in connection with agricultural improvements	
		Demonstrations	Extension of agricultural improvements
(1) Poona	(1) Kharpudi	(1) Demonstration of agricultural improvements suitable to village has been done.	50 acres area of 29 members was under Bajri graded seed.
	(2) Sakurde	(2) Do.	160 acres area of 20 members was under Bajri crop with graded seed.
	(3) Khamgaon	(3) Do.	Nil.
	(4) Supe	(4) Do.	20 acres area was under Jowar with graded seed of one member.
	(5) Ravangaon	(5) Do.	176 acres and 150 acres of 20 members were under graded seed of Jowar and Pusa-4 wheat. Members have taken 6 sets of dry-farming implements.
	(6) Palsdeo	(6) Do.	500 acres of 16 members was sown with graded Jowar seed and one member had 20 acres under dry-farming method.
(2) Nagar	(1) Dhorjalgaon	(1) Growing of Jowar by dry-farming method. (2) Growing of Jowar with seed graded. (3) Advantages of N. R. cotton, Akola bajri and Pusa wheat No. 4 Pig campaign work has been demonstrated.	Nil.
	(2) Erandgaon		
	(3) Vadule		
	(4) Sheogaon		
	(5) Devasade		
	(6) Newasa		
	(7) Vadala		
	(8) Khamgaon		
	(9) Kashti		
	(10) Vadgaon		
	(11) Hatgaon		
			Pig and deer campaign for all members has been proposed to be taken.

District	Name of the Co-operative Credit Society	Work done in connection with agricultural improvements	
		Demonstrations	Extension of agricultural improvements
(3) Sholapur	(1) Temburni	Demonstration of seed-grading and dry-farming has been done.	(1) 100 acres area of 11 members was under graded seed and 4 members had manure pits dug.
	(2) Akola		(2) 200 acres area of 15 members was under graded seed and two members had manure pits dug.
	(3) Kasegaon		(3) Nil.
(4) Satara	Walva, Koregaon, Karad and Tasgaon Associations have got several societies affiliated to Associations and the demonstration work is conducted through the Members of the Credit Societies.		
(5) Canal Area	(1) Belwadi	Demonstration of Manjri method of cane cultivation amongst heavily indebted members.	Plots of cane are arranged and supervised to convince members that Manjri method at less cost gives better yields.
	(2) Kambleswar		Two plots are arranged at Wagaj,
	(3) Late		1 at Sangvi, 5 at Kambleswar and
	(4) Wagaj		3 at Lasurna.
	(5) Sangvi		
	(6) Bavda		
	(7) Lasurna		

In order to help this work, the Assistant Registrar, Co-operative Societies, Central Division, Poona, has made arrangements to finance for required implements wherever they are essential in the first stage and thus for Sholapur and Nagar some amounts have been made available and implement sets are purchased.

The work will be watched carefully for some years of all the above societies from the point of experiment.

(J) *Agricultural Classes*.—Owing to financial stringency in T. A. grants this section of propaganda was required to be dropped this year. However, this has been found a useful way of propaganda as well as serving means of adult professional education.

(K) *Leaflets*.—During the year under report, the following two leaflets were completed :—

Serial No.	Name of Leaflet	English	Marathi
(1)	Laying out of land for Irrigation under Deccan Canals (specially for Nira Right Bank Canal).	1	..
(2)	Revision of leaflet No. 4 of 1923 on "Tambera Disease of Potatoes".	1	1

In connection with revision or preparation of leaflets by other agricultural officers in the presidency, help to them was rendered by supplying the required information and data so far as this Division was concerned.

(L) *Tractor for demonstration and hire purposes.*—As said above, Case Tractor from Sir Sassoon David Trust Fund has been received for this Division and it was given out on hire at concessional rates, as shown in

*Depth in inches	Rate per acre	Rs.
6 to 7	..	5
7 to 8	..	6
8 to 9	..	7
9 to 10	..	8
10 to 11	..	9
11 to 12	..	10

the margin,* for creating a liking amongst cultivators. The Tractor was worked on double shift system, i.e., for 16 hours keeping two sets of workmen. The total area worked was 302 acres and 15 gunthas and the amount realised as hire was Rs. 1,926. In this connection, the department underwent a loss of Rs. 1,023. The experiment will have to be continued for one turn more to know the efficient way of working these Tractors, which is nowhere available, by undergoing a similar loss like the present season.

The power chaff-cutter has been received late and the work has not been commenced.

Summary of work done in each District and Canal area.

(1) *Poona District.*—The work of demonstrating crops and improved methods of crop growing continued to be done on the same lines as reported previously. Spanish Peanut has yielded 1,015 lbs. dry pods per acre. Pusa-4 wheat, in spite of very bad attack, yielded 878 lbs. as against 461 lbs. of local wheat under irrigation. As per Government Resolution, General Department, No. 4290, dated 7th August 1924, Poudrette was demonstrated as a good manure for potatoes and garlic in Khed Taluka and Purandhar Taluka respectively. A dose of 20 cartloads of Poudrette to potato crop has yielded 10,600 lbs. potatoes per acre and 10 cartloads to garlic has given 2,649 lbs. garlic per acre. In the east Poona, extensive propaganda is being conducted of seed-grading and demonstrating dry farming methods. In the case of seed-grading, nearly 255 cultivators from 30 villages have graded the following quantities of seeds before sowing :—

	lbs.
Jowar	33,072
Bajri	4,740
Wheat	3,996

The average yields obtained from graded seed vs. non-graded seed were 599 lbs. vs. 550 lbs. grain per acre of bajri and 467 vs. 397 of jowar, respectively.

The area under dry farming method increased to 176 acres as against 75 of last year and the yields were 836 lbs. grain and 1,903 lbs. fodder for

dry farming method as against 505 lbs. grain and 1,467 lbs. fodder in local method.

Twenty-seven demonstrations were held which consisted of 5 jamabandi, 8 implement and 14 crop. Help was rendered to Khed Taluka Development Association for organising a programme and two rural uplift works at Khed Shivapur and Tathavade.

(2) *Ahmednagar District*.—As reported in last year's report, the work was concentrated on mass propaganda. The temporary staff continued. The District Agricultural Show Committee financed Rs. 150 only for the remuneration to teachers in addition to the sets of implements purchased last year, and the District Local Board permitted 19 teachers to help the Department for demonstrating the agricultural improvements at a nominal remuneration. The total amount paid as remuneration was Rs. 44-8-0 only at annas 8 for each demonstration. This method of propaganda is showing signs of success and similar experiment for the first year has been started in Barsi Taluka the report of which would be found under Sholapur District. The same centres, reported last year, were continued. This year, the area under improved method increased to 650 acres. At these centres, under the presidentship of Revenue Officers and District Local Board President and councillors, 40 demonstrations were held. This year again, nearly 6,000 cultivators from the interior of the district attended these demonstrations. In the coming year, the area under improved method is likely to increase up to 3,000 acres. For rapid increase of this method, more number of implements are required in future years for hiring out the same to cultivators in a famine tract. In spite of bad season, the yields obtained on an average with improved method are tabulated below :—

Treatment	Yield per acre		Increase per cent.	
	Grain	Fodder	Grain	Fodder
	lbs.	lbs.	lbs.	lbs.
(1) Dry-farming method	431	1,204	69 per cent.	23 per cent.
(2) Local method	255	975	..	..

Trials of new wheat strains, bajri and rice strains were conducted. These would be reported separately by the Economic Botanist and Crop Botanist to Government. Pusa-4 has yielded 600 lbs. grain as against 200 lbs. of local wheat. Manurial trial with Sodium Nitrate to garlic crop has been found to give an yield of 2,500 lbs. garlic vs. 1,860 lbs. per acre, the dose of Sodium Nitrate being 40 lbs. per acre.

In addition to the above crop demonstrations, 32 demonstrations of sulphur dusting against grapes, spraying lucerne crop for prevention of aphid and steeping jowar were arranged. This also included some Jamabandi demonstrations.

Help was rendered to Co-operative Implement Societies for preparation of valuation statements, etc.

(3) *Satara District*.—The scheme of the District Local Board for financing the Taluka Development Associations in this district has been continued. The progress of agricultural work through Taluka Development Associations has been satisfactory. The staff mainly concentrated on rendering full help to all the Associations in organising the work like shows, etc. The following is a list of shows and demonstrations—small and big—which were organised with the help of agricultural staff in the year under report. These were attended by a large number of cultivators :—

(1) Big show	..	..	..	1
(2) Small shows	..	..	..	4
(3) Crop demonstrations and demonstrations at fairs	..	..	1.	43
(4) Seed grading demonstrations			..	75
(5) Implement demonstrations	..		..	20
(6) Jamabandi demonstrations	..		..	10

The associations arranged to draft small leaflets for their respective talukas and these have numbered 12. These were drafted with the help of the District Agricultural Overseer. 25,000 lbs. seed potatoes, 13,121 lbs. Sulphate of Ammonia and 10,000 Basrai plantain suckers were distributed. New crops like Pusa-4 wheat, ginger, new varieties of jowar, tobacco strains, rice and nagli strains, Darjeeling potatoes, American red sweet potatoes were tried and demonstrated. In Javli and Satara Talukas, rat campaign is attempted in rice tract. Out of these new crops, Pusa-4 wheat shows signs of spreading in Man, Basrai plantains, grape-vines, American red sweet potatoes, Budhperio Jowar No. 53 and grafted mangoes in Satara and Koregaon, and Satpani jowar, ginger and Gujarat No. 6 tobacco in Vita Taluka.

(4) *Sholapur District*.—In this district, 6 Field Bunding and Implement, 83 seed-grading and steeping, 32 crop and 45 inter-culturing jowar and groundnut crop demonstrations were organised. These were largely attended by cultivators. At Mohol Farm, a big demonstration was arranged to show land development and dry farming methods on 11th January 1931 and this was specially attended by nearly 250 cultivators and landlords from Madha, Sholapur, Barsi and Pandharpur Talukas. The propaganda of seed-grading has now well established in several centres. In Barsi Taluka, 13 villages which were tackled for three years have adopted the method wholesale. The temporary kamgar has been shifted to a new centre in Karmala Taluka where 8 centres were tackled in the year under report. Further propaganda of seed grading in Barsi Taluka is organised through the District School Board teachers at 8 new centres by paying a remuneration. The work shows signs of success.

The average yield of several plots distributed over a large area of graded seed was as under :—

Treatment	Yield of per acre		Increase per cent.	
	Grain	Fodder	Grain	Fodder
	lbs.	lbs.	lbs.	lbs.
Graded	553	790	32 per cent.	15 per cent.
Non-graded	417	683	..	..

As a result of propaganda in Sholapur District, 544,526 lbs. jowar seed was sieved, out of which the agricultural staff and teachers graded 224,000 and 12,800 lbs. respectively and the rest by Madha and Karmala Associations. The seed sieved by Credit Societies and private persons is not reported.

Dry farming method was demonstrated at several centres and the yields obtained are as under :—

Treatment	Yield per acre of	
	Grain	Fodder
	lbs.	lbs.
(1) Dry farming method	392	942
(2) Ordinary method	256	826

Pusa-4 has been a favourable wheat in Sholapur District under well irrigation and the yield obtained is 1,095 lbs. per acre.

Mr. C. R. Gokhale, District Agricultural Overseer, Barsi, has been attempting grading of groundnut seed and as a result, a sieve has been devised by him. The usual mixture found by him in groundnut seed at Barsi is of 3 types of grains weighing 12, 16 and 31 per tola and these could be separated by the sieve. Several trials were made and as a result graded seed is found to have given 964 lbs. vs. 773 lbs. of non-graded. Help was rendered to the Taluka Development Associations, Co-operative Implement Societies, Rural Uplift Village and Non-credit Societies. The work of Tractor-plow is reported under separate heading.

(5) *Canal area*.—(This includes Nira Right Bank, Nira Left Bank, Godavari and Pravara Canals).

On the canals, 65 demonstrations were held to show the advantages of N.R. cotton, groundnut, fruit culture, seed-grading in jowar, inter-culturing cotton, cane varieties, sann green manuring and Java method

of planting. In addition to this, a small agricultural show was arranged at Kopargaon in conjunction with the Conference of all irrigators of Deccan Canals held in December 1930. These were largely attended and benefits are being fully realised. A large quantity of jowar seed was graded by the staff. The yields obtained with graded-vs. non-graded are summarised below :—

Name of canal	Yield of rabi jowar under irrigation	
	Sown with graded seed	Sown with non-graded seed
	lbs.	lbs.
Nira Left Bank	1,171	1,044
Godavari	658	398
Nira Right Bank	454	393

Crops like cotton, wheat, jowar treated with different manures were grown in cultivators' fields. These were demonstrated. Cotton, treated with Sulphate of Ammonia and Sodium Nitrate, has yielded as under after different rotations :—

Crop	Treatment	Yield of seed cotton in different rotations		
		After plant cane	After first ratoon	In eight months block
Cotton	(a) 25 lbs. N. in Sulphate of Ammonia.	lbs. 1,516	lbs. ..	lbs.
	(b) 25 lbs. N. in Nitrate of Soda.	1,712	..	....
	(c) Control	1,236	..	....
	(a) 20 lbs. N. in Sulphate of Ammonia plus 15 lbs. N. in oil cake.	..	635	634
	(b) 20 lbs. N. in Nitrate of Soda plus 15 lbs. N. in oil cake.	..	602	644
	(c) Control	..	417	461

Sann green manuring has been taken on all canals and the area has increased. Help was rendered to the Nira Left Bank Irrigators' Association for conducting the programme.

Section III.

AGRICULTURAL ORGANISATIONS.

(a) *Taluka Development Associations.*—During the year, the total number of Taluka Development Associations was 15. The work has been continued on usual lines. Some of the Associations in Satara District have undertaken higher responsibilities of propaganda and are working efficiently. Tasgaon Taluka Development Association organised a big agricultural show at Bhilawadi which was very effective. Walwa Taluka Development Association organised a show and arranged a two days' Land Development class.

His Excellency the Right Honourable Sir Frederick Hugh Sykes visited Satara on 12th July 1930. At this time, to the address given by the District Local Board, Satara, a reply was given by His Excellency about the work of Associations by District Local Board in the following words:—

"I have learnt with the greatest interest what this District Local Board has been able to do in encouraging and financing Taluka Development Associations. I understand that from 1926 until now, the scheme has been working satisfactorily by which Kamgars lent by the Agricultural Department have been working under the control of Agricultural Committee of the Board. The system is now being finally reviewed in the light of experience gained and I trust that it will soon be possible to put it on a more permanent footing."

Madha and Karmala Taluka Development Associations did an extensive propaganda of seed-grading. Baramati Irrigators' Association made strong attempts by representations to Honourable Member to redress grievances of Bagayatdars. The work on the whole put in by all Associations, except Junnar, was to the mark.

(b) *Non-Credit Societies.*—The following statement will show the work done in the year by the Non-Credit Societies which have been working. The rest of the non-credit societies have not developed work as yet:—

Name of society	Value of produce sold
	Rs.
"A"—Sale societies.	
(1) Haveli Taluka Agricultural sale society ..	2,02,238
(2) Nira Canal Societies' Purchase and Sale Union, Baramati	4,33,454
(3) Kurduwadi Purchase and Sale Union, Kurduwadi.	36,034
(4) Barsi Taluka Agricultural Sale Society, Barsi ..	32,713
(5) The Warna Valley Co-operative Sale Union, Ltd., Islampur	2,22,843

<i>" B "—Manure Societies.</i>		Value of manure purchased and distributed
		Rs.
(1) Peth Manure Society	.. ..	1,070
(2) Retre Harnax Manure Society (District Satara)	.. ..	1,050
(3) The Malkhed Manure Society	.. ..	415

		Value of produce sold
Name of society		
<i>" C "—Machinery and Implement Societies.</i>		Hire earned.
(1) Haveli Taluka Agricultural Machinery Society	.. ..	771
(2) Pathardi Implements Society	.. ..	233
(3) Sheogaon Implements Society	.. ..	245
(4) Jamkhed Implements Society	.. ..	255
(5) Madha Taluka Implements Society	.. ..	77
(6) Tadavale Implements Society	.. ..	217
(7) Pandharpur Taluka Implements Society	.. ..	162
(8) Kapuskhed Implements Society	.. ..	39
(9) Rui Chattisi (unregistered)	.. ..	150

Section IV.

AGRICULTURAL SERVICES.

The services under this head can be mentioned in the following form :—

Section IV-A.

BORING OPERATIONS.

Due to insufficient grant, it was, in the first instance, decided to work only three boring machines during the year, and, accordingly these machines commenced working from 1st July ; but, in view of the proposal to Government by the department to close the boring operations from 1st September 1930, owing to financial stringency, no further work was undertaken.

The total footage bored by these machines was 603'-6". Thus, there were only four bores new and two of the last year were completed. Of these six bores, three were successful.

Section IV-B.

ENGINEERING ADVICE AND ASSISTANCE.

The demand for the advice and help from the Mechanical Assistant continued as usual ; but this year, it was reduced owing to slump in prices. The following summary shows the work executed during the year :—

(a) Erection of new plants and machinery.—

- (1) 45 B. H. P. Blackstone " Spring Injection " cold starting S. I. type engine with 8 of Macarthy cotton gins (single roller with 1½" shafting and 5 bearings), 2 Cooper's improved rotary oil.

mills and foundation for 92 Chattanooga mill. And the shed for the machinery measuring 50 ft. × 36 ft. (with underground masonry structure for 48 ft. × 3" shaft for working above machinery) was designed and completed (Phaltan, District Satara).

(2) 8 B. H. P. Hornsby Kerosine Oil Engine with 2½" Centrifugal Pump, 1 Chaff-cutter and 2 grinding mills (Loni Agricultural School, Loni Kalbhor).

(3) 4½ B. H. P. Ruston-Hornsby Kerosine engine with 2" Centrifugal Pump on the river Karah (near Saswad).

(b) *Help to cultivators for correcting foundations of the machinery (which were finished by local Engineers) and reinstating same.*—

(1) 22 B. H. P. Imperial Hot Starting Crude Oil Engine with 92 Chattanooga Mill (Padegaon, District Nagar).

(2) 7 B. H. P. Bates Hot Starting Crude Oil Engine with 3" Centrifugal Pump (Belapur, District Nagar).

(c) *Preparation of estimates.*—During the year, he had 40 applications out of which only 18 were disposed of.

(d) In addition to this, he helped the erection of 2 steel sheds, one at Mohol (50' × 20') Farm and the other at Kopargaon Farm (20' × 12').

The Government Power Plants at Manjri, Kopargaon, Loni Kalbhor, Baramati and Ranjankhole were looked to and also the Case Tractor (from Sir Sassoon David Trust Fund) which has been received this year.

Section IV-C.

PIG-KILLING CAMPAIGNS.

The work is becoming popular and new centres from other divisions are coming forth to take the help of Officer In Charge, Pig Campaigns. The Officer had to visit North Central Division and Gujarat Division for two campaigns in these divisions. The contribution from people from different groups was as under :—

Serial No.	Tracts worked	Name of group	Amount collected
			Rs. a. p.
1	South Central Division	Palshi Group	113 9 9
		Sinhagad Group	14 1 4
		Mungi Group	160 0 0
		Godavari Canals	220 0 0
		Pravara Canals	78 8 0
2	Gujarat	Nadiad and round about	29 14 6
3	North Central Division	Niphad Group	82 8 0

The work done is summarised in the following statement :—

Statement showing results of Pig Campaign work during 1930-31.

Serial No.	Tracts worked	Period of campaign	Total expenses	Share borne by people	Grant-in-aid by Government	Wild animals killed		
						Pigs	Deer	Blue-bull
1	2	3	4	5	6	7		
			Rs. a. p.	Rs. a. p.	Rs. a. p.			
1	Palshi Group ..	July and September.	138 9 9	113 9 9	25 0 0	26	..	..
2	Sinhagad Group.	August and October.	21 2 0	14 1 4	7 0 8	15	..	..
3	Mungi Group ..	October, December and January.	236 0 0	160 0 0	67 0 0	39	20	..
4	Godawari Canals.	February and March.	300 0 0	220 0 0	80 0 0	21	..	..
5	Pravara Canals.	April and May.	117 12 0	78 8 0	39 4 0	27	..	..
	<i>Gujarat Division.</i>							
6	Nadiad (9 square miles round Nadiad).	November ..	59 13 0	20 14 6	29 14 0	..	..	30
	<i>North Central Division.</i>							
7	Nipbad Group ..	December ..	166 0 0	82 8 0	82 8 0	15	..	..
		Total ..	1,038 4 9	707 9 7	330 11 2	143	29	30

Serial No.	Tracts worked	Cost per kill	Area of crops protected.	Cost per acre of crop protection	Remarks
1	2	3	4	5	6
		Rs. a. p.		Rs. a. p.	
1	Palshi Group ..	5 5 2	250 acres ground nut. 2½ months protection.	0 9 0	Poona guns and local beaters (2 campaigns). Area decreased by half on account of low rates of sale.
2	Sinhagad Group.	1 6 6	....	..	Local guns and beaters (2 campaigns). Rain did not allow more work.
3	Mungi Group ..	3 7 6	3,500 acres Jowar, Bajri and Gram.	0 1 0	Poona guns and local beaters (3 campaigns).
4	Godawari Canals.	14 4 6	2,500 acres cane	0 1 11	Poona guns and local valdu beaters gang. The previous three years' work had cost about Rs. 6 per kill and as the pigs were few the cost has this year increased.
5	Pravara Canals.	4 5 9	260 acres adsalu cane.	0 7 3	Poona guns and local valdu beaters gang.
	<i>Gujarat Division.</i>				
6	Nadiad (9 square miles round Nadiad).	1 15 10	9 square miles round Nadiad, practically cleared.	..	Officer and his Shikari assistant and four men to help cut path through hedge to follow Blue-bull. Experimental work by the T. D. Association, Nadiad.
	<i>North Central Division.</i>				
7	Nipbad Group ..	11 0 0	120 acres cane	1 6 0	Cost high as pigs not found hiding in cane which had to be worked to satisfy irrigators; but in Prickly-pear in villages on border of irrigated area. Experimental work by the Kadwa Irrigators' Association.

In addition to the above work, Koregaon Taluka Development Association in Satara District to whom the work was demonstrated for 3 years since 1926, has worked independently for 10 villages and the following statement shows the work done independently :—

Area worked, i.e. jungles	Period of work	Number of working days	Total kills	Total cost	Cost per kill
				Rs. a. p.	Rs. a. p.
(1) Padali ..	24th September to 31st December 1930.	12	26	64 11 0	2 7 10
(2) Palsi ..					
(3) Solashi ..					
(4) Chavaneshwar ..					

As reported in last year's report Mr. D. M. Damle (Wun, Berar, C. P.) continued the work and reports to have killed 250 animals (164 pigs, 69 chitals, 9 blue-bulls, 3 Hycues, 2 Jackals) at a total cost of Rs. 725, i.e. Rs. 2-14-0 per kill. At the instance of this campaign conducted for two years in Berars, the Director of Agriculture, Central Provinces, has indented upon the services of the Officer in Charge, Pig Killing Campaigns for one month for training people and arrangements are being made to spare him.

Section IV-D.

FIELD EMBANKMENTS.

The Bunding Officer toured for 188 days and visited 70 villages all over the Division for land development work. It will be seen from the number of peoples' applications that the demand on his services is increasing and he has been unable to attend to all works in time. The statement below gives the idea of applications disposed of during the year under report :—

Statement showing the position of applications for land development with the Bunding Officer, S. C. D., Poona, during the year 1930-31.

Serial No.	Name of the District	Applications for Land Development schemes (to be carried on with Tagai loan from Revenue Department received from Revenue Officers)				
		Balance from last year	Received during the year under report	Total in hand	Disposed of during the year under report	Balance for next year
1	2	3	4	5	6	7
1	Poona ..	..	8	8	5	3
2	Sholapur ..	9	5	14	5	9
3	Satara ..	5	2	7	3	4
4	Ahmednagar ..	5	..	5	3	2
	Total ..	19	15	34	16	18

Serial No.	Name of the District	Applications for Land Development schemes (to be carried on with private own money received from cultivators and landlords independently)				
		Balance from last year	Received during the year	Total in hand	Disposed of during the year under report	Balance for next year
1	2	8	9	10	11	12
1	Poena ..	13	8	21	4	17
2	Sholapur ..	23	34	57	6	51
3	Satara ..	4	6	10	..	10
4	Ahmednagar ..	13	3	16	2	14
	Total ..	53	51	104	12	92

Note 1.—Sixteen Tagai loan applications covered an area of 1,200 acres and cost Rs. 40,000. Full advice was given as regards the height of bund and proper construction of waste-weir without preparation of site plans.

Note 2.—Twelve schemes (private applications) covered an area of 1,000 acres and cost Rs. 45,000. Full survey was done and plans and estimates prepared and handed over. Out of these, 5 schemes have been completed.

In addition to the above individual works, attempts are being made to float joint schemes and three centres are being tackled (Tathavde, Kharpudi and Mulegaon) but it seems that some more time would be essential.

As the demand on Bunding Officer has commenced to increase as will be seen from the private applications, an attempt was made to see how much time and additional help is essential for survey and plotting the work. Work of an applicant, who wanted 220 acres of his land near Sholapur to be surveyed and plotted, was taken in hand and the Bunding Officer was asked to concentrate all his efforts with the temporary help

and it was found that a good deal of help is essential in dealing with such schemes. The following statement will give an idea :—

Statement showing the units of labour-requirements for the work of survey and recording levels for a Bunding Scheme at Soregaon, taluka Sholapur.

Serial No.	Classification of work	Time			
		Dates		Number of days	Working hours per day
		From	To		
1	Preliminary survey..	10th April 1931.	11th April 1931.	2	8
2	Measuring and pegging.	12th April 1931.	19th April 1931.	13	
	Do. ..	29th April 1931.	3rd May 1931 ..		
3	Recording levels ..	20th April 1931.	28th April 1931.	9	
	Do. ..	4th May 1931 ..	5th May 1931 ..	2	
4	Preparing the plans and estimates.	6th May 1931 ..	14th May 1931..	9	4
5	Marking alignments of bunds and waste-weirs.	15th May 1931..	18th May 1931..		
	Total ..	10th April 1931.	18th May 1931..	39	..

Serial No.	Classification of work	Units of work		Coolies required for survey	Total area worked for survey	Average area worked out per day	Remarks
		Officers	Surveyors				
1	Preliminary survey..	4	2	36	Acres 220	Acres 110	This was partially done. It would take 10 days more to complete the drawing work.
2	Measuring and pegging.	6½	6½		200	22½	
	Do. ..			16	20	4	
3	Recording levels ..	18	9	36	200	22½	
	Do. ..	2	2	8	20	10	
4	Preparing the plans and estimates.	9	9	..	220	24½	
5	Marking alignments of bunds and waste-weirs.	3	..	12	..	..	
	Total ..	42½	28½	108	220	5½	

Labour charges :—(1) Surveyor at Re. 1 per day.

(2) Cooly at As. 6 per day.

Thus, from the above tabular statement, it will be seen that the detailed survey work of a consolidated holding of 220 acres took 42½ days of actual work of the Bunding Officer and nearly equal number of days of a Surveyor in addition. The total number of coolies required was 108.

In addition to these works, he helped in shows for demonstrating the use of Bunds, etc., and delivered lectures at several places.

Section V.

AGRICULTURAL EDUCATION.

Loni School.—This is the 21st year of the school. In the year under report, 58 applications were received ; out of which 30 were selected, but only 23 joined the school. The scholarships paid were Rs. 8 and Rs. 5. The total number that appeared for the examination at the end of year was 15 and 20. The following statement shows the results of the examination :—

Year				Number of boys	Number of boys appeared	Number of boys passing the examination
1st year	..	..	..	15	14	14
2nd year	..	..	..	21	20	19

The expenses of the year amounted to Rs. 12,579 as against Rs. 12,263 of last year and the receipts Rs. 1,927 as against Rs. 2,404.

The school was suggested to be retrenched from June 1931 owing to financial stringency. It has however been decided to continue the school on reduced scale for the 2nd year students only to complete their course for one year. In 21 years time, the school has done good service and sent out in different parts 341 students and 49 teachers trained. The following statement gives an idea of distribution of students from different parts of Marathi speaking districts :—

Statement showing the number of past students of the Loni Agricultural School with their districts, year by year, from beginning of the school.

Year	Poona	Satara	Sholapur	Nagar	Nasik	East Khandesh	West Khandesh	Belgaum
1	2	3	4	5	6	7	8	9
1912	4	1	1	2	4	1	..	..
1913	..	..	1	3	1	1	..	..
1914	4	4	4	4	..	..	..	2
1915	4	2	3	..	4	..	..	1
1916	1	1	1	1	5	..	..	..
1917	2	..	..	2	7	3	..	1
1918	..	2	2	..	..	2	..	1
1919	1	2	2	..	5	3	1	1
1920	1	..	..	2	2	1	1	..
1921	..	..	2	1	1	8	1	1
1922	2	..	1	2	3	5	..	..
1923	1	(1)	(1)	4(1)	2	11(1)	..	1
1924	1(1)	1(1)	2	4(1)	2	6	(1)	..
1925	2(1)	2(1)	(1)	5(1)	(1)	7(1)	..	..
1926	2(1)	1(1)	1(1)	1(1)	(1)	4(1)	..	(1)
1927	2(1)	2(1)	3(1)	2(1)	(1)	2(1)	..	1(1)
1928	4	6(1)	1(1)	3(1)	(1)	4(1)	(1)	1
1929	5	4	1	3(1)	(1)	2(1)	(1)	..
1930	3(1)	8(1)	(1)	..	1	5	(2)	1(1)
1931	3(1)	2	(1)	2	1(1)	10	..	..
Total ..	42(6)	38(7)	25(7)	41(7)	38(6)	75(6)	3(5)	11(3)

Year	Dharwar	Bijapur	Thana	Ratnagiri	States	Other provinces	Total of boys	Total of teachers
	10	11	12	13	14	15	16	17
1912	..	..	..	1	1	..	15	..
1913	..	..	..	1	1	..	8	..
1914	1	..	1	..	2	..	22	..
1915	..	..	..	..	..	1	15	..
1916	..	..	..	1	10	..	20	..
1917	..	..	..	2	2	1	20	..
1918	..	..	..	1	1	3	12	..
1919	1	..	..	..	3	3	22	..
1920	..	1	..	..	1	4	13	..
1921	..	..	..	..	2	1	17	..
1922	..	..	..	1	6	1	21	..
1923	..	..	..	..	2	..	21	(4)
1924	..	..	..	..	3	1	20	(4)
1925	..	..	..	..	..	..	16	(6)
1926	..	..	..	..	3	..	12	(7)
1927	..	1	..	..	..	..	13	(7)
1928	..	1	(1)	..	2	..	22	(7)
1929	..	..	..	..	..	..	15	(4)
1930	..	..	..	..	..	..	18	(6)
1931	..	..	..	..	(1)	1	19	(4)
Total ..	2	3	1(1)	7	39(1)	16	341	(49)

Remark.—Figures in bracket indicate the numbers of teachers trained for Agricultural Bias Classes.

There are 18 agricultural bias classes in this Division. The district staff rendered every possible help to these classes by arranging cropping schemes, examining boys etc. so far they could do and the T. A. permitted.

The Honourable Minister for Agriculture Diwan Bahadur S. T. Kambli visited the school and expressed satisfaction at the working and replies given by boys. As a result of it, he awarded Rs. 10 as prizes for two boys.

The poultry section continued to be managed well by Mr. Khot.

Section VI.

Co-ordination of Revenue Irrigation and Agricultural Officers.—Hearty co-operation was received from both the Departments without which the shows and demonstration work described above could not have been possible.

Divisional Board of Agriculture.—The Chairmanship of the Divisional Board remained with me till first November 1930, during which time one meeting was held. From November, it was transferred to the Assistant Registrar, Co-operative Societies, Central Division, Poona.

District Local Board and Agricultural Department.—In order to take agricultural improvements brought out by the Agricultural Department to the door of cultivators, every available source requires to be utilised and attempts are directed in that direction. During the last decade and a half, bodies like Taluka Development Associations, Non-credit Societies like Implement Sale etc. Societies, Provincial Bank and its branches, and Co-operative Credit Societies, were used for conducting the propaganda and success to some extent in some cases and to a greater extent in some has been achieved, according to the conditions of the tract and district. In this Division, specially in the famine zone or precarious tract for want of several of the above mentioned bodies, attempts were made, during the past some years, through District Local Board, who, in some cases provided money to Taluka Development Associations like the one in Satara, allowed teachers to help for propaganda and these attempts go to prove that to fulfil the recommendation of Royal Commission on Agriculture, Chapter IV, recommendation 73—“The Agricultural departments should pay greater attention to the problems of cultivators in dry and precarious tracts”,—District Local Board in this tract, who collect local fund from actual cultivators, should allot annually a certain amount for propaganda work as they do for education at Loni School and should come to the help of Agricultural department. They already spend lacs of rupees for education, and help for propaganda would be the help for adult education (of actual cultivators). In United States this extensive work is helped by several Acts like Smith Lever Act of 1914 and on the same basis provision is made under section 50 (j) of the Bombay Local Boards Act, 1923, which is required to be fully brought into force.

Help to District Local Board Schools.—All the District Staff in this Division had to help the Educational Department as well as to the

District Local Boards for conducting examinations of Agricultural Bias Classes and vernacular final examinations in each district. Nearly a month's time is required to be spent for this work by each District Agricultural Overseer.

Miscellaneous.—The staff of this Division has contributed their full quota in supplying material to the Shetki Shetkari, Agricultural College Magazine and Local newspapers. Mr. S. B. Bhutkar, Agricultural Overseer, Satara, has regularly contributed agricultural news to the local papers at Satara.

A special note on "Taluka Development Associations in Bombay Presidency and their place in Agricultural Propaganda" has been prepared by me at the request of the Central Education Board of Bombay Provincial Co-operative Institute, Bombay, and the same is being printed in the form of a Booklet. The monogram on "Co-operative Cotton Sale in Bombay Presidency" prepared by me for the above body has already been printed in the Book on "Co-operation in Bombay".

With the increased activities, the staff in this Division has tried to do their best.

B. P. VAGHOLKAR,

Deputy Director of Agriculture,

South Central Division, Poona.

APPENDIX E.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, SOUTHERN DIVISION, DHARWAR, FOR THE
YEAR 1930-31.

(1) I held charge of the office of the Deputy Director of Agriculture, Southern Division, throughout the year. Messrs. Kottur and Shevde continued as Cotton Breeder and Cotton Superintendent, respectively. There was no change in the subordinate staff also. No member of the staff was on long leave. For extension of cotton-work round Hubli and Gadag, two graduate assistants and five Kamgars were appointed to work under the Cotton Superintendent with the aid of subsidy given by the Indian Central Cotton Committee. The Hubli and Gadag schemes extend over a period of five years and the staff appointed is temporary for that period.

Season.

(2) Anti-monsoon rains were scanty and preparation of land for Kharif crops was not satisfactory. Monsoon rains were not also timely and most of the Kharif crops suffered from want of moisture, especially in July and August when there was a long break. September and October rains improved the Kharif crops to a certain extent but yields were all below normal. Cotton and Rabi crops made a good start with sufficient moisture in the ground but suffered later owing to unfavourable wind and diseases, resulting in very poor yields. Cotton suffered much from north-east wind, wheat from rust and Rabi-Jowar from a disease (inspected to be *Rhizoctonia bataticola*) which did not occur for many years past. The prices of all agricultural produce considerably fell during the year and the cultivator is left without any purchasing power. With poor yields and very low prices, the position of the cultivator has gone from bad to worse. He could not pay off his dues to the Societies and Sawakars and is further going into debt. The agricultural wages and land-rent have not as yet proportionately come down and the situation of the cultivator under the circumstances is very awkward. The supply of fodder and drinking water was adequate.

(3) The work done by different sections is summarised under the same heads, as it was done in the previous years to facilitate references and comparison, where needed, viz. :—

- (a) Research and Experiments,
- (b) Propaganda,
- (c) Organisation,
- (d) Direct services to the public,
- (e) Agricultural Education and
- (f) General.

(a) Research and Experiments.

(4) *Dharwar Farm.*—Plant breeding work on cotton (chief money crop of the Division) continued to receive the close attention.

Dharwar No. I $\times$ Rosea Cross Strain No. 15 gave more yield than Jayawant in a wilt-free plot but gave less in another where there was slight wilt. As this cotton was found to be very susceptible to wilt both on the Farm and in the District, its spread has been decided to be stopped.

(5) Breeding wilt-resistant types of cotton continued to receive major attention of the Cotton Breeder. In two wilt-free plot replication-tests Jayawant cotton yielded more than Dharwar No. I. It is as good as Dharwar No. I cotton in quality and is better in all other respects. It is proved to be wilt-resistant and is, therefore, a good substitute for Dharwar No. I which is susceptible to wilt. These will be maintained as reserve. Selections in the Cross Dharwar No. II (Dharwar No. I $\times$ Rosea No. 15) were observed to be not so good as selections in the Cross Kumpta wilt-resistant $\times$ (Dharwar No. I $\times$ Rosea No. 15) in staple. With the object of improving ginning percentage and colour of Jayawant cotton still further, crosses were made between Jayawant $\times$ (Dharwar No. I $\times$ Rosea 15) and Jayawant $\times$ Komila 4-2. Results will be watched with interest. Dharwar No. I $\times$ Wagale cross strain No. 6 and the Cross Kumpta wilt-resistant $\times$ (Dharwar No. I $\times$ Rosea No. 15 strain No. 2-2) referred to in paragraph 5 of the last year's report, were compared with Jayawant and their results are given below:—

Name of cotton	Yield per acre	Ginning per cent.	Staple length	Spinning property
1. Jayawant	422	27.4	0.91	40 s.
2. Dharwar I $\times$ Wagale Cross ..	373	31.0	0.85	33
3. K.W.R. $\times$ 15 Cross ..	449	32.5	0.84	36

Eight wilt-resistant cottons were compared with Dharwar No. I for the degree of wilt-resistance and were observed to be as follow:— Dharwar No. I 65.2, Kumpta Farm 15.7, Dharwar No. II 7.0, Jayawant 4.2, Kumpta wilt-resistant 5.7, Dharwar No. I $\times$ Wagale 5.9, Kumpta wilt-resistant $\times$ (Dharwar No. I $\times$ Rosea 15) 5.1, Wagale 1.6 and Komila 3.1.

(6) Jayawant $\times$ Wagi was found to be very late and will be discontinued. Kumpta wilt-resistant $\times$ Tashkant has been observed to be a fine cotton and will be maintained for further observations.

(7) Selfing and multiplication of the seed of different varieties of cotton introduced in the Division continued on the Dharwar Farm. 70 lbs. of Jayawant and 40 lbs. Gadag No. I cotton-seed were obtained by selfing. The Jayawant crop happened to be poor and the quantity of selfed seed was less than what was required viz. 100 lbs. It is proposed to adequately manure the cotton plots which are intended for selfing and seed-multiplication.

(8) The selections made in the Cross Gadag No. I $\times$ Sea-Island have not been found to be promising. They were observed to be weak in staple. The selection made in the Dharwar-American cotton styled as Dharwar-American II, resisted Red-leaf-blight better than Gadag No. I

but its yield was not more. The experiment will be repeated. Sulphur dusting was tried as a remedy against Red-leaf blight and nine dustings were given to Gadag No. I cotton from the seedling to the flowering stage. This checked the disease to a considerable extent and helped the crop to produce almost double the yield of untreated plots. The experiment will be repeated.

(9) As decided last year eleven samples of cotton seed from Hubli and seven from Gadag Sale Society, were tested for germination during the year. The percentage of germination varied from 78 to 94.5 and all the seed stocked by the Societies was found to be good.

(10) With the object of ascertaining the effects of blanks, especially in connection with wilt-study, a spacing experiment was undertaken with Jayawant cotton. A spacing of $2' \times 1'$ is common for cotton and it was compared with $2' \times 2'$, $2' \times 3'$, $2' \times 4'$, $2' \times 5'$ and $2' \times 6'$ in rows. The increase in yield per plant was not proportionate to increased space.

(11) Jowar breeding work has been stopped; but selected strains of Fulgar white, Fulgar yellow, Bilichigan, Nandyal and Savner were continued to be maintained and small quantities were distributed to the cultivators who demanded the same. The demand for Nandyal was more than for others. Spanish pea-nut variety of groundnut strain No. 5 was sown all over the Farm for seed and was distributed round Haveri, Dharwar and Bailhongal.

(12) The other important experiments conducted on Dharwar Farm under the guidance of the Superintendent, are summarised below:—

Crop Experiments.—As explained in paragraph 11 of the last year's report, three varieties of tobacco viz. Nadiad No. 6, Nippani and Adcock were compared during the year on Fisher's Method. All the three varieties suffered from *Cercospora Nicotiana* disease like last year and the quality of the tobacco was spoiled. Nadiad No. 6 suffered less and gave more yield (872 lbs. per acre) than the other two. Tobacco crop has a future in the transition-tract, if a remedy is found out for the disease and the Plant Pathologist has been requested to deal with it. Five varieties of wheat viz. local red glumed, local white glumed, local ordinary, Pivala Kathya strain No. 103 and rust-resistant strain No. 808 were compared on Fisher's Method in five replications. All varieties suffered from rust which was very severe during the year. The yields were poor and the grain was shrivelled. Rust-resistant strain No. 808 suffered less and gave slightly better yield. In another test where different rust-resistant strains obtained from the Economic Botanist to the Government of Bombay, were compared. Strain No. 809 did better than others. Strain Nos. 808 and 809 will be compared again during the next year. Five varieties of cotton, viz. Kumpta ordinary, Dharwar No. I, Dharwar No. II, Jayawant and Dharwar No. I $\times$ Rosea strain No. 15 were again compared on Fisher's Method in five replications. The yields obtained were 341 lbs., 375 lbs., 423 lbs., 403 lbs. and 375 lbs. and the percentage of wilt-affected plants was 1.28, 7.95, 1.39, 0.49 and 8.24, respectively. Taking yield and price together, Jayawant did better than others. Five jowar varieties viz.

Fulgar white, Fulgar yellow, Muddi Nandyal, Nandyal and Bilichigan were compared on Fisher's Method in five replications. Fulgar yellow did better than others. The yield was 1,834 lbs. grain and 3,854 lbs. Kadbī per acre. Jowar crop was attacked by striga during the year. Two varieties of gram viz. Burmah and local were compared. Burmah variety was found to be wilt-resistant and gave better yield than local.

(13) *Manurial Experiments*.—Results of experiments with different quantities of farm yard manure on jowar crop, continue to be in favour of ten tons per acre. Results on cotton are in favour of $2\frac{1}{2}$ tons every year to jowar and cotton. Results of sann green manuring taken from three different experiments are as good as those of farm yard manure and confirm the statement made last year that where no farm yard manure is available in sufficient quantity, sann crop may be grown in the transition-tract and buried in the soil once in four years. The application of sulphate of ammonia 14 lbs. nitrogen together with $2\frac{1}{2}$ tons farm yard manure per acre to jowar crop, has given higher yields than farm yard manure $2\frac{1}{2}$ tons per acre so as to cover the cost of extra manure but its application to cotton crop was not found to be economic.

(14) *Cultural Experiments*.—The results of seven years in spacing experiment on cotton indicate that sowing wider than two feet apart does not give any appreciable advantage. In two-year-rotation experiment groundnut-jowar has given better results than tobacco-jowar or cotton-jowar. The three-year-rotation experiment will be summarised next year. In the seed-rate experiment on groundnut there is very little difference between 80, 100 and 120 lbs. seed-rate. It seems advisable to adopt 80 lbs. seed-rate. Results of the experiment on different times of sowing groundnut are not consistent with those of the previous year. The experiment will be repeated. Length-wise and cross-wise sowing of wheat gave no better results than length-wise sowing again during the year. The experiment with sieved and unsieved jowar seed was vitiated owing to uneven attack of striga. The experiment with groundnut and cotton in alternate rows against groundnut and cotton in blocks with jowar-rotation, completed one cycle of two years. The results are in favour of growing groundnut and cotton in alternate rows. In the small garden on the Dharwar Farm mangoes and figs continued to receive attention. Closer study on these crops has been recently undertaken. Mangoes were dusted with sulphur against hoppers and figs against rust.

(15) *Gokak Farm*.—Sugarcane continued to be the most paying crop on this Farm. H.M.544 gave higher yield than local Pundya in good soil and equal to Yellow Mauritius in Kirl soil. J.213 brought from Manjri was observed to be a semi-drought-resistant variety suited to Gokak Canal Tract. It will be compared with Pundya next year. Selection in local maize on the basis of weight of cob and proportion of grain to cob, continued. A few plants which are above seven tolas each giving more than 85 per cent. grain, have been selected and they will be compared with general seed next year. Three varieties of tobacco viz. Nippani, Nadiad No. 6 and Adecock were compared. All varieties suffered from *Cercospora Nicotiana* and the quality of tobacco was, therefore, very poor. Nadiad No. 6 suffered less than others and gave 928 lbs. yield per acre.

Cambodia (C.O.2) cotton which is very successful under well-irrigation in the Madras Presidency was compared with Gadag No. I in ten replications. C.O.2 suffered very little from Jassids and red-leaf-blight whereas Gadag No. I suffered very badly. The yield of C.O.2 was 2,000 lbs. per acre against 520 lbs. of Gadag No. I.

(16) *Manurial Experiments*.—Sulphate of ammonia 75 lbs. nitrogen combined with cake 75 lbs. nitrogen per acre applied to sugarcane, gave again better results than calcium cyanamide 75 lbs. nitrogen combined with cake 75 lbs. nitrogen per acre, indicating that sulphate of ammonia is a better top-dressing manure than calcium cyanamide. Difference in net profits between the two was Rs. 136 per acre. The cyanamide had bad effect on germination. Many mother-shoots died and the stand of the crop was uneven. Three artificial manures viz. Nitrate of Soda, Calcium cyanamide and Ammo Phos 28 lbs. nitrogen per acre with and without farmyard manure were compared with no artificial manure according to Fisher's Method. The results are not in any way encouraging in both series, indicating that artificial manures are not paying on cotton even under irrigation. In the quantitative farm yard manure experiment on maize, five tons per acre continued to give better results than 7½ tons and ten tons. The results of three years taken together are decidedly in favour of five tons per acre and the experiment will be discontinued.

(17) *Cultural and rotational experiments*.—Two-year-rotation experiment with sugarcane again proved that maize with tur is a better rotation than chillies. The difference in the net profits per rotation was Rs. 70 per acre. Chilly is a risky crop in the Gokak Canal Tract and maize with tur is likely to be adopted by the cultivators. In three-year-rotation experiment only one block completes the cycle of three years. The experiment will be summarised, when the other two blocks will complete their cycles of three years.

(18) *The orchard and nursery continued to work at a profit*.—Demand for lemon seedlings has very much increased and that for Santra and Mosamba grafts is also fair. The nursery continued to pay more than the orchard. In all 8,569 seedlings and grafts were distributed from the nursery. The total expenditure on the garden was Rs. 737 and the income from it was Rs. 1,083 during the year, showing a net profit of Rs. 346.

(19) *Mugad Rice-breeding Station*.—Four promising strains of Mugad viz. Early No. 161, Inter Nos. 81 and 249 and Late No. 141 and three strains of Antersal viz. Early No. 67, Inter No. 90 and Late No. 200 were compared with local, in replication-series on Fisher's Method and in seed-multiplication plots on a large scale. In both places these strains have again done better than local checks and have given 13 to 25 per cent. more yield. There seems to be no need of continuing the comparative trials any more. 3,140 lbs. seed of Mugad Strains and 2,350 lbs. seed of Antersal Strains has been raised on Mugad Farm during the year for multiplication and distribution in the District. The study on the Cross Mugad 81 × Kolamba 39 continued in F6 generation and thirteen promising strains have been isolated, which will be compared with Mugad 81 for yielding capacity during the coming season. Selection-work was started during

the year on another, important, very early variety of paddy called Dodagya which is grown on upper lands without the aid of irrigation. 55 samples of Dodagya which were obtained from different parts of the Division were grown on Mugad Farm and 300 individual plants have been selected for further study on different characters.

(20) *Tegur Cattle Breeding Farm*.—The offspring of the cross between local cows and Amrit Mahal bull is showing marked improvement in its third generation. 15 bull calves and 8 cow-calves were born during the year. The total number of the herd on 31st March 1931 was 140 against 139 last year. 9 bull-calves were sold and 7 died during the year. The cultivators of Mallad Tract are much pleased to see the progress made on Tegur Farm and the bull-calves produced there. Results of crossing local sheep with Merino ram have also continued to be good as far as the quality of wool is concerned. The disease which affects sheep on Tegur Farm is still being studied by the Veterinary Assistant and no proper remedy has been found out. Hay and silage were prepared on the Farm as usual and jowar and Kulthi were grown both for fodder and grain.

(21) *Experiments in cultivators' fields*.—The District Staff continued to conduct useful experiments in cultivators' fields. Jayawant cotton was compared with local Kumpta in Athani, Bijapur, Bagalkot and Gadag Talukas of the dry tract and in Bailhongal Taluka of the Transition Tract, with a view to aim at covering the whole Kumpta area with Jayawant cotton. The results in almost all places are in favour of Jayawant, indicating that this cotton can successfully be introduced in the Dry Tract also. Jayawant cotton was remarkably free from wilt, whereas local Kumpta cotton suffered. Cambodia (C.O.2) cotton which is reported to be very successful under irrigation in the Madras Presidency, was compared with Gadag No. 1 in eight different places of the Division under irrigation and it has given higher yields in six places and equal yields in two places. It is a good cotton and seems to be very promising under irrigation. Banila has given better results than Cambodia (C.O.2) at Bijapur and Indi. Four selected strains of Mugad variety of paddy viz. Early No. 161, Inter 81 and 249 and late 141 and three strains of Antersal variety viz. Early 67, Inter 90 and late 200 were compared with local in different places round Belgaum, Dharwar, Haveri, Hangal and Mundgod again during the year. All these have done better than local in most places and deserve distribution on a large scale. Inter and Late Strains have been found to be popular round Belgaum. Strain Nos. 81 and 200 are popular round Dharwar. Late Strains are popular under Dharma Canal in Hangal Taluka. Mugad Inter 249 is very liked in Mundagod Petha. Nadiad No. 6 tobacco gave higher yield than Nippani at Sadalga and Kongnoli. Attempts are being made to introduce this Nadiad variety of tobacco in Chikodi and Hukeri Talukas of the Belgaum District on a large scale. Experiments in Dharwar and Haveri Talukas of the Dharwar District have also yielded encouraging results. The selected strain of Nandyal variety of jowar was compared with local Nandyal at Dharwar in ten replications with good results and the cultivators are demanding the seed of the selected strain. Bajri Strains 37, 54 and 59 obtained from Poona were compared with local at Bijapur in four

cultivators' fields with negative results. Pivalya Kathya strain 103 was compared with local at Gadag, Bagalkot and Bijapur. The results at Bagalkot and Bijapur are encouraging whereas those at Gadag are not so. Results of artificial manure experiments (sulphate of ammonia) on jowar at Dharwar and Haveri are not encouraging whereas those at Bailhongal are significant. Results of experiment with sulphate of ammonia and bone-meal on paddy crop are not also encouraging. Dry farming experiments were conducted at Bijapur on a small scale and at Khatijapur on a fairly large scale. The results of experiments during the year indicate that deep ploughing considerably increases the yield but it does not pay its extra cost. The average results of the past three years are in favour of shallow ploughing but none of the dry farming methods show more net profits than the check plots. Observations on these various experiments in cultivators' fields were made at regular intervals and harvesting was done under the close supervision of the District Staff. All observations and yields have been recorded in Experimental Note Books like last year.

(b) *Propaganda.*

(22) *District Cotton Work.*—Multiplication and distribution of Dharwar No. I, Jayawant and Gadag No. I cottons, continued round Hubli and Gadag and that of Dharwar No. I $\times$ Rosea cross round Bailhongal. As stated in paragraph 21 of the last year's report, the Reserved Area round Hubli was all under Jayawant cotton. Dharwar No. I cotton was dropped for its susceptibility to wilt. For the same reason the multiplication of Dharwar No. I $\times$ Rosea cross also was abandoned. The crop in the Reserved Areas of Jayawant and Gadag No. I cottons was inspected from time to time and rogued. The produce was collected and ginned separately and the seed obtained has been stocked for distribution during the coming season. Jayawant seed was multiplied also at Bailhongal, Haveri and Athani. The quantity of work done is summarised in the following statement :—

Name of variety	Generation	Quantity distributed in 1930-31	Area sown in 1930-31	Quantity of produce obtained in dokras	Quantity of seed stocked for distribution in 1931-32
Jayawant	III IV V	 10,899 143,192	 1,077 14,936	 742 5,476	 9,940 166,180 1,211,280
Total ..		154,091	16,013	6,218	1,387,400
Gadag No. I	III IV V	773 19,720 223,149	88 1,928 21,622	33 597 4,611	7,936 1,40,105 1,066,291
Total ..		243,642	23,638	5,241	1,214,332

The Reserved Areas for Jayawant and Gadag No. I cottons round Hubli and Gadag have been considerably increased with the aid of the Indian Central Cotton Committee, Bombay, to cover an area of two lacs acres in each case, as explained in paragraph 23 of the last year's report. The season was very unfavourable and yields from the Reserved Areas were far below normal. The seed obtained is sufficient for only $1\frac{1}{2}$ lacs acres in each case.

(23) For distribution of general seed the Cotton Sale Societies and the Officers of the Agricultural Department continued to work together. Seed-dealers in Gadag and Ron also stocked and distributed certain quantities of Gadag No. I cotton seed. The estimated area in acres sown with pure seed of improved strains during the year through different agencies, is given below :—

Name of the variety	Area controlled by the cotton Staff	Area sown with seed distributed by the Societies	Area sown with seed stocked by other agencies	Total area
Jayawant	18,000	....	....	18,000
Dharwar No. I .. ..	....	50,000	....	50,000
Gadag No. I	23,600	55,000	39,400	1,18,000
Dharwar No. I × Rosea ..	2,500	....	....	2,500

The Societies at Hubli and Gadag had stocked all the seed available from the Reserved Areas but could not distribute the whole of it, owing to fall in the price of seed and irregularity of sowing rains. For organisation of increased reserved areas and distribution of general seed, the Indian Central Cotton Committee gave subsidy for additional staff, roguing and incidental expenditure. The Committee also gave loans to the Societies to meet losses which they incurred during the year with a condition that they should be returned from their seed-profits in future years. The help given by the Indian Central Cotton Committee was very opportune and valuable.

(24) *Grading and auction-sales.*—In all 6,276 dokras of Jayawant, 3,211 dokras of Dharwar No. I, 16,573 dokras of Gadag No. I and 224 dokras of Dharwar No. I × Rosea cross were graded and sold by auction in different centres during the year against 524 Jayawant, 3,935 Dharwar No. I, 14,251 Gadag No. I and 1,524 Dharwar No. I × Rosea last year. The graded cotton fetched comparatively better prices than those prevailing in the market. It will be seen from the above figures that there is considerable progress in Jayawant and Gadag No. I cottons. Dharwar No. I and Dharwar No. I × Rosea cross cottons will not at all be grown during the next season and they will entirely be replaced by Jayawant.

(25) *Working of the Cotton Transport Act.*—1,087 licenses by road and 111 by Rail were issued from Gadag Office to import 14,565 and 1,279, dokras, respectively. The number of licenses issued from Bagalkot Office was 212 for 5,571 dokras by road and 14 for 223 dokras by Rail.

A new Office was opened at Nargund where only seven licenses were issued for 44 carts by road. The import by Rail without licenses is completely stopped and that by road is well brought under control by getting all Check Stations inspected by a Special Officer and by making the Licensing Clerks to regularly inspect all arrivals in Gadag and Bagalkot Markets. The pay of the Sanadies appointed at the Check Stations was raised from Rs. 5 to Rs. 12 per month. The Dalals' Association in the Gadag Market have given an agreement that any one who receives cotton from outside the Protected Area without a license, will be dismembered. With these arrangements the illicit import by road is very little and it is hoped that it will soon disappear. The Cotton Transport Act is working very well in the interests of the grower and consumer of the improved varieties of cotton in the Southern Division.

(26) *General District Work.*—The District Agricultural Overseers conducted demonstrations of improved implements, mainly through the Taluka Development Associations, as the grant under demonstrations had to be surrendered. The demonstrations of iron ploughs are not needed now, as the cultivators all over the Division know their use. More attention was devoted to the demonstrations of Stone-Roller, wheat-thresher and seed-seives. Forty-eight seed-seives were prepared and sold in Gadag Division alone during the year. Stone-roller is getting popular in the Bijapur District where its use was unknown. Spraying potato-crop with lime-sulphur-wash against the attack of Jassids and fumigation of potato-seed with petrol against potato-moth, were freely demonstrated at Belgaum with very good results. Most of the potato-growers have taken to spraying and ten of them have built their own Fumigation-Pits. During the last few years potato-cultivation round Belgaum had become very risky owing to these troubles and the cultivators were on the point of abandoning it. They were much pleased to find now that they can control the pests and can grow a successful crop. It is estimated that a saving of about one lac of rupees is effected every year by adopting these two remedies in time. Propaganda in connection with the spread of selected rice-strains in Mallad, Spanish Pea-nut variety of groundnut in Gadinad and Nadiad No. 6 tobacco in Chikodi and Hukeri Talukas of the Belgaum District and tur as a row-crop in maize in the Gokak Canal Tract, engaged considerable attention of the general District Staff.

(27) Agricultural and Cattle Shows were organised in eight places (four in Belgaum District, three in Dharwar District and one in Bijapur District). It is again gratifying to observe that the local Fair-Committees took great interest in organising these Shows, as required by the Agricultural Department and distributed prizes to cattle. During these Shows and at the time of other demonstrations lectures were delivered on agricultural improvements and public attention was drawn to the points of direct utility to the respective tracts. Village Officers were given demonstrations in three Jamabandi meetings and magic-lantern lectures were organised in five important places. The Village

Development Sauntha at Kakhandaki appointed an Agricultural Graduate who has made a study of the different families in the village and work in various directions is being undertaken.

(28) *Propaganda against smut on jowar.*—This work was continued mainly through Revenue Officers and Taluka Development Associations. The District Staff conducted a number of demonstrations of applying sulphur-dust to jowar-seed against smut. All the Mamlatdars in Belgaum and Dharwar Districts were requested to dispose off the remaining copper sulphate packets and give indents for sulphur-dust-packets. In all 7,500 copper-sulphate-packets in these Districts and 43,500 sulphur-dust-packets in Bijapur District by the Wilson Anti-Famine Institute were distributed during the year, which was sufficient to treat seed for about 465,000 acres. 31,000 copper-sulphate-packets are still to be accounted for by the Mamlatdars. Attempts will be made to get these back and distribute only sulphur-dust-packets next year.

(29) The Kanarese Agricultural Magazine continued to serve the cultivators and many interesting articles appeared in it. Departmental Leaflets were distributed in all demonstrations and meetings. Correspondence with individual cultivators also increased considerably. It seems necessary at this stage that every District Agricultural Overseer should have a clerk but the time is not favourable for submitting any such proposal.

(c) *Organisation.*

(30) The Seed Societies at Devihosur and Hulkoti did some good work. Others showed no appreciable progress. It is desirable that Credit Societies should distribute improved seed to their Members instead of cash which they require for seed.

(31) The Co-operative Cotton Sale Societies at Hubli and Gadag continued to do good work. They have considerably increased the scope of their work by adopting new seed-multiplication schemes prepared by the Agricultural Department with the aid of the Indian Central Cotton Committee, Bombay. The Bailhongal Cotton Sale Society could not get out of the boycott of Dalals and has practically done no work during the year. Other Cotton Sale Societies also have not done any appreciable progress. The position of different Societies and their work done during the year, are tabulated below :—

Name of Society	No. of Members	Share capital	Reserve Fund	Number of dokras sold			Value of Cotton sold
				By auction	By private treaty	Total	
Hubli ..	2,610	17,450	19,918	4,110	8,360	12,470	4,12,500
Gadag ..	2,136	41,502	45,290	10,640	5,691	16,331	5,86,042
Haveri ..	..	7,035	586	..	665	665	17,858
Dharwar ..	374	5,305	..	287	129	416	12,291
Bailhongal ..	307	4,185	6,884	..	3,184	3,184	1,17,515
Bagalkot ..	276	5,445	213	..	1,099	1,099	69,551

The prices of cotton were very low during the year.

(32) The Nipani Tobacco Sale Society sold jarda worth Rs. 37,347 and realised a net profit of Rs. 628. The Sankeshwar Sale Society sold different articles worth Rs. 31,422 and earned a commission of Rs. 699 which did not cover the expenses. The Society sustained a loss of Rs. 100. The Chilly Sale Society at Byadagi withstood the boycott of Dalals and has done fair work. Some Cattle-breeding Societies, chiefly Sidenur, Kadampur and Sadalga, are showing good progress while others are not doing so well.

(33) *Fencing Societies*.—Benefits of co-operative fencing against wild pigs are recognised by the cultivators all over Mallad Tract but joint action is getting more difficult owing to the apathy of the absentee-landlords. I am forced to reiterate that the proposed legislation to coerce minority should be effected soon for further substantial progress. The Fencing Society at Arbhavi was registered. The fencing scheme at Tegur was retaken up and it has now matured. Most of the share-capital is collected and papers are being prepared for registration. This scheme is a complete enclosure and protects an area of 1,300 acres. The paddy land coming in the scheme has good water-supply and is very valuable. The scheme is thus a very prospective one. In Mundagod Division individual cultivators purchased and constructed $5\frac{1}{2}$ miles fencing during the year. Attempts to organise Co-operative Societies in few places have not yet succeeded.

(34) Campaign for the removal of the prickly pear against wild pigs continued in the Mundargi Petha of the Dharwar District. A subscription of Rs. 2,126 was collected and an amount of Rs. 1,742 was paid to Government towards the repayment of tagai loan. The affected area in Dambal was partly eradicated during the year. In order to coordinate the activities of the several small Prickly Pear Committees, a Mahal Development Association was formed and registered during the year. This is a good advance made. Prickly pear poisoning is still under experiment. The Mysore Agricultural Department is trying to eradicate prickly pear by distributing cochineal insect which attacks and destroys the pear. Some infected material was obtained from the Entomologist to the Government of Mysore and grafted on to a cactus hedge at Mundargi in February 1931. The insect has already spread on ten bushes and its further progress is being observed. This seems to be a cheap remedy, though the progress of destruction is slow. Further information on the subject is being collected from all points of view.

(35) The Crop-Protection-Campaign against wild deer continued in three villages with very good results. The work done in these villages may better be tabulated in the following statement:—

Names of the villages	Name of the Taluka	Subscriptions collected	Expenses incurred	Number of deer killed	Area protected by the campaign
		Rs. a. p.	Rs. a. p.		
Mallapur ..	Ron ..	254 12 0	327 4 5	63	4,200
Koujageri ..	" ..	323 10 7	226 0 0	38	2,300
Balaganur ..	Gadag ..	130 6 0	147 7 0	45	6,000
	Total ..	708 12 7	700 6 5	146	12,500

This work has been very much appreciated by the cultivators, as it gives them the direct and immediate relief. It has increased the popularity of the Taluka Development Associations at Ron and Gadag which are taking part in it and it stands as an object-lesson to other Associations to undertake similar works which serve the common good of the majority of the cultivators of a village or a group of villages.

(36) Thirteen Taluka Development Associations including the one at Mundargi recently registered, continued to do work during the year. The leading members of Halyal Taluka who have long been attempting to form a Development Association, have collected an amount of Rs. 4,000 and are anxious to get it registered soon. The important items of work done by various Taluka Development Associations are given below:—The Gadag and Ron Taluka Development Associations organised crop-protection-campaigns and did propaganda work for Cotton Sale Society at Gadag. They helped the Sale Society in organising its Seed-Depôts and induced cultivators to sell their improved cotton by auction-sale through it. It is gratifying to note that the Sale Society at Gadag and the two Associations are working together for the good of the cultivators. The Gadag Association has varied activities and has maintained its position in "A" Class. The Hangal and Hirekerur Taluka Development Associations are trying to introduce selected strains of paddy and working for cattle-improvement. The Hirekerur Association is working in close co-operation with Byadgi Chilli Sale Society. The Hangal Association has taken up problems of the irrigators under Dharma Canal for solution. The Haveri Taluka Development Association worked for the spread of selected strain of Spanish-pea-nut variety of groundnut and its auction-sale. The Associations at Bijapur and Indi attempted to improve their gardens. The grape-vine-cultivation on Indi Farm has attracted the attention of garden-cultivators. Extension and improvement of garden-cultivation and general advice on bunding were the main items of these two Associations. The Athani Association has taken interest in the spread of Jayawant cotton and its sale. The Chikodi Association is much interested in the spread of artificial manures. The Gokak Association is trying to introduce various improvements effected

by the Agricultural Department in the Gokak Canal Tract. It has a Sub-Committee to deal with problems of irrigation. The Murgod-Mahal Development Association is working for the spread of Jayawant cotton. The Mundargi Mahal Association is at present chiefly concerned with the removal of prickly pear. All these Associations conducted demonstrations of improved implements where needed and conducted extensive propaganda for copper-sulphate and sulphur-dust against smut on jowar. The total amount of subsidy given to these Associations amounted to Rs. 7,303 during the year. The objects of Taluka Development Associations are now being realised by the cultivators.

(37) The Dharwar District Agricultural Association is in moribund condition. The Members are not taking any interest for its revival. The Hand given by the Agricultural Department had no full work and his services were purely utilised for tractor-work.

The Wilson-Anti-Famine Institute at Bijapur continued its activities in various directions. The District Agricultural Overseers worked in close co-operation with this Institute in their agricultural propaganda. Distribution of improved implements was the main work of the Institute. Eighty-one ploughs and spare parts worth Rs. 866 were sold from various Depôts.

(38) The Divisional Board of Agriculture held its quarterly meetings regularly and guided the work of the District Officers and Taluka Development Associations.

(d) Direct Services to the Public.

(39) *Field-Embankments.*—One Bunding Officer continued to work in Bijapur District and the other in Dharwar and Belgaum Districts. The Agricultural Overseers of the Bijapur District also inspected and guided bunding work. The demand for expert advice on bunding has considerably increased but the limited staff cannot meet all of it. More Special Staff for bunding in the Agricultural Department has become a pressing need. In the Bijapur District plans and estimates were prepared for 35 schemes costing Rs. 36,725 in twenty-six villages. Out of these, twelve depended on tagai loans and the remaining twenty-three were for land-owners who could spend their own money. The bunding works that were in progress, were inspected from time to time and instalments of tagai loans were recommended. In Dharwar and Belgaum Districts twenty-two schemes were prepared, costing Rs. 16,700. Three Officers of Hyderabad (Deccan) State were trained in bunding for three months. They worked with the Bunding Officer on sites selected for them. The object of selecting sites was to train them in all aspects of bunding. An experiment of bunding and draining surface-water was laid out on Arbhavi Farm. Fields in the Gokak Canal Tract are undulating and suffer from excess of water during rains. The object of the experiment is to see how far bunding and surface-drainage will help matters. An experiment on broad-based-low bund was laid out in the deep black soil near Bijapur. Bunding work of the Agricultural Department has been very popular in the Southern Division.

(40) *Boring*.—Five Musto power machines worked during the year till the end of November, when the work had to be closed in accordance with Government Orders. In all 16 bores were taken till the end of November 1930 and the total depth bored was 1,510 feet against 2,531 feet last year. Out of these 16, 11 bores succeeded and 5 failed. The details of each bore are given in Appendix A.

(41) *Work of the Mechanical Assistant*.—The Mechanical Assistant attended to the machines working on different Farms of the Division and their repairs. He prepared fifteen plans and estimates for pumping plants and one for Power Cane Crusher. He constructed two pumping plants, one at Suraleshwar in Dharwar District and the other at Sulla in Bijapur District and attended to the repairs of four pumping plants. An amount of Rs. 65 was charged for repairs and was credited into the Treasury. The number of power pumping plants is increasing, especially in Bijapur District. The Mechanical Assistant continued to be fully engaged.

(42) *Karajgi Fodder Storage*.—All stacks were repaired and kept in neat condition. The Machinery was also attended to. Enquiries were made with various Collectors but there was no demand for fodder. The shredded Kadbi inside the pressed bales is in sound condition.

(43) *Tractor ploughing and Tagai Loans*.—A good deal of land in the Southern Division is affected with Hariyali which is a deep-rooted weed. Hand-digging is generally adopted for removing it; but it is a very slow and sometimes costly operation. Iron ploughs drawn by bullocks are used to a certain extent for removal of Hariyali but the number of bullocks available for the purpose is too limited to do any extensive work. The Agricultural Department and the Burmah Shell & Co. have co-ordinated their activities to see whether tractor-ploughing can solve the problem. The Burmah Shell ordered two tractors, viz. one Mercedes Benz and the other Caterpillar and ploughed 487 acres during the year. The Agricultural Department canvassed the area required, at fixed rates and inspected the quality of work done. Tagai loans amounting to Rs. 6,760 were recommended for the cultivators to the Revenue Department which are being paid to the Firm direct by the Treasury. Attempts are being made to extend this co-ordinated work during the coming season. Besides loans issued for bunding and tractor-ploughing, tagai loan applications for other agricultural improvements amounting to Rs. 11,100, were dealt with during the year.

(e) *Agricultural Education.*

(44) The Vernacular Agricultural School at Devihosur completed its seventeenth year. It was continued to be managed by only one Graduate Assistant, Mr. V. C. Pavate. 127 applications were received for admission. Sixty students were asked to appear for Entrance Examination and twenty-three were admitted at a reduced scholarship of Rs. 5 per month. Most of these are the sons of farmers. Eight have passed their ordinary Vernacular School Final and three their agricultural bias class final examination. These facts prove the popularity of the school. Twenty-three students in the First Year, thirteen in

the Second Year and two Vernacular Teachers for Agricultural Bias Classes, received education during the year. Results of the annual examination continued to be good. Out of thirteen students in the Second Year, twelve students passed and out of twenty-three in the First Year, twenty-one passed. The two teachers also got through the examination. It is gratifying to note that 124 past students are reported to be working on their Farms and twenty of them attended the annual social gathering of the school during the year with their annual reports of the work done on their Farms.

(45) The Agricultural Bias Classes are growing more popular and there is a demand for their increase. Examinations of all the Agricultural Bias Classes were conducted by the District Staff of the Agricultural Department. With increased number of these classes, the work of examining the students has very much increased and I must reiterate here that the District Local Board should have their own examining staff.

General.

(46) Other important events of the year were :—

(a) The Honourable Divan Bahadur S. T. Kambli, Minister for Agriculture, toured in the Southern Division twice during the year. He inspected Dharwar and Gokak Farms, Devihosur School, Tallur Joint Bunding Scheme, Gokak Taluka Development Association and Potato Fumigation Pits at Belgaum. He was pleased to note the various activities of the Department in the Southern Division.

(b) The Director of Agriculture toured two weeks in the Division, inspected various institutions and District Work of the Department and made many valuable suggestions.

(c) The Deputy Director of Agriculture attended Crop Research Committee Meeting and Wilt Conference at Poona and took part in their deliberations. He presided over the Agricultural Conference at Chikodi.

(d) The Deputy Director of Agriculture was nominated by Government as a Member of the Forest and Railway Advisory Committees. He attended the Forest Committee Meeting for the first time on 7th May 1931 and arranged to secure wood for implements worth Rs. 2-8-0 to the cultivators in the forest-villages free of cost. He also attended Railway Board Meeting in Bangalore on 27th June 1931 for the first time. He inspected the work of destroying prickly pear there with the aid of cochineal insects.

(e) The Deputy Director went to Dhulia and studied the new cotton market established under the Cotton Market Act of 1927. He also studied Amalner and Jalgaon Cotton Markets, when he had been to Dhulia.

(f) The twelfth Divisional Conference of the Officers of the Agricultural Department in the Southern Division was held.

(47) The work of the Agricultural Department in the Southern Division continued to extend, especially in the direction of bunding, fencing and spread of improved strains of cotton, groundnut and paddy crops. The staff needs strengthening with more funds for their travelling allowance. The growing work cannot be curtailed and the existing staff had to work hard with very limited funds at their disposal in these days of retrenchment. All the members of the staff, except a very few, did their duties well. Many Revenue Officers and private gentlemen continued to help our propaganda and organisation work and my thanks are due to them. The disturbed political atmosphere did not in any way affect our work ; but fall in prices of agricultural produce has depressed the minds of cultivators and has thrown them out of balance. The propaganda for agricultural improvement is getting difficult but it is hoped that this situation may not last long.

S. S. SALIMATH,

Deputy Director of Agriculture,
Southern Division, Dharwar.

STATEMENT

Statement showing particulars of bores made in

Serial No.	Name of well-owner	Survey No.	Name of Taluka	Name of Village	Surface or well with dimensions of the well	Diameter of bore
1	2	3	4	5	6	7
<i>Dharwar District.</i>						
1	Hubli Municipality ..		Hubli ..	Hubli ..	Surface ..	6½"
2	Do. ..		Do. ..	Do. ..	Do. ..	5½"
3	Do. ..		Do. ..	Do. ..	Do. ..	5½"
4	Mr. S. D. Deshpande ..		Haliyal ..	Haliyal ..	Well 4½' x 15' (Round.)	5½"
5	Mr. Balappa Anigundi ..		Do. ..	Do. ..	Surface ..	4"
6	Mr. G. V. Patil ..		Gadag ..	Kurtkot# ..	Do. ..	5"
7	Mr. V. H. Ilur ..		Do. ..	Mundargi ..	Do. ..	4"
8	Mr. Shriwasa B. Kulkarni ..		Do. ..	Hesur ..	Well 30' x 23'	5"
9	Mr. S. S. Yelgar ..		Do. ..	Mundargi ..	Well 30' x 25'	4"
<i>Belgaum District.</i>						
10	Mr. Dhondichand Balafam Solapurkar ..		Chikodi ..	Nipani ..	Surface ..	4½"
11	Mr. Ratanchand Revchand Vakhariya ..		Do. ..	Do. ..	Do. ..	4½"
12	Mr. Santram Aba Dalv ..		Do. ..	Do. ..	Do. ..	4½"
13	Mr. M. N. Joshi ..		Do. ..	Do. ..	Do. ..	4½"
14	Mr. R. S. Kangali ..		Hukeri ..	Sankeshwar ..	Do. ..	4½"
15	Mr. Malhar Shankar Kulkarni ..		Do. ..	Do. ..	Do. ..	4½"
16	Mr. S. S. Patil ..		Do. ..	Do. ..	Do. ..	4½"

Southern Division during the year 1930-1931.

Depth of actual bore.	Water before bore in gallons per hour	Water after bore in gallons per hour	Number of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating oil, coal, carting, casing, cutting shoe etc., charges	Departmental charges for the well-owner	Supervision and depreciation charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
200'-0"	Nil.	360	360	141 6 0	421 0 0	295 0 0	242 7 5
155'-0"	Nil.	240	240	81 9 0	230 3 0	215 8 0	133 8 6
180'-0"	Nil.	280	280	58 7 0	191 0 0	245 0 0	188 7 1
88'-0"	20	300	280	148 8 0	77 1 0	78 0 0	181 8 11
94'-6"	Nil.	240	240	202 2 0	134 6 0	116 12 0	260 9 9
73'-0"	Nil.	240	240	54 6 0	42 4 0	96 8 0	143 1 5
80'-0"	Nil.	250	250	70 0 0	50 0 0	95 0 0	50 13 0
35'-0"	300	700	400	22 5 0	28 6 0	35 0 0	88 10 1
25'-9"	60	Nil.	00	20 8 0	22 6 0	Nil.	82 1 11
81'-0"	Nil.	300	300	54 6 0	60 6 0	104 0 0	125 5 2
94'-0"	Nil.	250	250	65 0 0	59 12 6	116 0 0	122 8 3
75'-0"	Nil.	Nil.	Nil.	56 4 0	50 7 6	Nil.	116 8-10
66'-9"	Nil.	240	240	46 14 0	44 3 6	74 0 0	120 8 7
100'-10"	Nil.	Nil.	Nil.	47 0 0	45 12 6	Nil.	97 6 0
134'-0"	Nil.	Nil.	Nil.	57 8 0	52 1 0	Nil.	85 13 1
50'-0"	Nil.	Nil.	Nil.	24 0 0	19 9 0	Nil.	127 10 1

Statement showing particulars of bores made in

Serial No.	Name of well-owner	Survey No.	Name of Taluka	Name of Village	Surface or well with dimensions of the well.	Running expenses, mechanical's wages and repairs
1	2	3	4	5	6	16
	<i>Dharwar District.</i>					Ra. a. p.
1	Hubli Municipality		Hubli	Hubli	Surface	458 5 0
2	Do.		Do.	Do.	Do.	370 14 5
3	Do.		Do.	Do.	Do.	435 15 0
4	Mr. S. D. Deshpande		Haliyal	Haliyal	Well 45' x 15' (Round)	433 9 0
5	Mr. Balappa Anigundi		Do.	Do.	Surface	601 0 6
6	Mr. G. V. Patil		Gadag	Kurtkoti	Do.	328 0 8
7	Mr. V. H. Ilur		Do.	Mundergi	Do.	192 8 3
8	Mr. Shrinivasrao B. Kulkarni.		Do.	Hesur	Well 30' x 25'	198 6 11
9	Mr. S. S. Yelgar		Do.	Mundergi	Well 30' x 25'	107 0 9
	<i>Bolgaum District.</i>					
10	Mr. Dhondichand Balaram Solapurkar.		Chikodi	Nipani	Surface	330 10 2
11	Mr. Ratanchand Ravchand Vakhariya.		Do.	Do.	Do.	331 1 2
12	Mr. Santam Aba Daiv		Do.	Do.	Do.	410 9 5
13	Mr. M. N. Joshi		Do.	Do.	Do.	339 10 2
14	Mr. B. S. Kangali		Hukeri	Sankeshwar.	Do.	270 11 0
15	Mr. Malhar Shankar Kulkarni.		Do.	Do.	Do.	312 10 8
16	Mr. S. S. Patil		Do.	Do.	Do.	360 14 0

Southern Division during the year 1930-1931—contd.

Cost of bore to the well-owner	Cost per foot for the owner	Total cost of bore inclusive of well-owner's and Departmental cost	Total cost per foot	Object of boring, i.e., Agricultural or drinking	Remarks, i.e., successful, unsuccessful or incomplete, on hand or abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
827 6 0	4 2 2 5	1,558 2 5	7 12 8	Drinking ..	Successful.
526 12 0	3 6 4	931 2 11	6 0 1	Do. ..	Do.
496 7 0	2 11 6	1,113 13 1	6 3 0	Do. ..	Do.
303 9 0	4 9 6	918 5 11	13 13 10	Agricultural ..	Do.
453 4 0	4 12 8	1,413 14 3	14 15 3	Drinking ..	Do.
192 6 0	2 10 1	658 3 1	9 0 4	Do. ..	Do.
215 0 0	2 11 0	406 9 6	5 1 4	Do. ..	Do.
85 11 0	2 7 2	367 12 0	10 8 1	Agricultural ..	Do.
42 11 0	1 10 1	322 0 8	12 8 1	Do. ..	Unsuccessful.
213 12 0	2 11 2 5	633 11 4	8 7 0	Drinking ..	Successful.
240 12 0	2 9 0	694 0 11	7 6 2	Do. ..	Do.
106 11 6	1 6 9	642 13 9	8 9 1	Do. ..	Unsuccessful.
165 1 6	2 8 0	624 16 3	9 7 6	Do. ..	Successful.
72 3 6	0 14 7	460 13 6	4 9 2	Do. ..	Unsuccessful.
100 9 0	0 13 1	508 0 9	3 12 8	Do. ..	Do.
45 9 0	0 13 9	532 1 1	10 10 3	Do. ..	Do.

APPENDIX F.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, GUJARAT, SURAT, FOR THE YEAR 1930-31.

I—Staff.

1. I resumed charge of the Office of the Deputy Director of Agriculture, Gujarat, from 13th September 1930 and controlled and guided the work since then.

Messrs. C. S. Patel, M. L. Patel, D. P. Mankad and K. B. Naik continued as Cotton Superintendent, Cotton Breeders, S. G., Surat, and N. G., Viramgam, and Divisional Superintendent of Agriculture, N. D., Ahmedabad, respectively.

Mr. T. V. Nagarsheth was transferred to this Division from S. C. D. and was posted at Amalsad Incharge of the Farm as well as three talukas of South Gujarat and when the Amalsad Farm was closed from 28th February 1931 he was posted as Superintendent, Surat Farm.

2. During the year under report three Institutions, viz. the Amalsad Farm, Surat Vernacular Agricultural School and Godhra Vernacular Agricultural School were closed and the staff was merged into the Departmental staff by deputing three Graduates and one Non-graduate under the Indian Central Cotton Committee as Boll-worm Control Officers in the Broach District. Mr. H. U. Vora was on deputation under the Indian Central Cotton Committee in connection with the Improved Cotton Extension Scheme in Surat area.

3. A Conference of the District Propaganda staff was held at Surat when the work done in each district was discussed and the programme of work for the next year was drawn out. The system of conducting trials on cultivators' fields taking detailed observations and interpreting results was discussed. Besides the present methods of propaganda were thoroughly reviewed and it was decided to work intensively from centres outward to get best results out of the propaganda work. It was decided that the introduction of any improvement by way of seed or implement or manure should be based on conviction of the farmer by means of a thorough field tests for few years on his fields and proper demonstration in different centres. During the discussion the necessity for close association between the District staff on one side and the Farm staff and the Breeding staff or Research staff on the other were emphasised with a view to get the best results. Thus the District work has been systematised and brought up-to-date.

II—Season.

4. The rainy season throughout the Division started about the middle of June. In North Gujarat first rains were insufficient. However rains in July and first week of August were continuous and heavy except in Broach as a result Maize in the Panch Mahals and Bajri elsewhere were practically a failure. Cotton crop however did well except in North Gujarat where the rains ceased early and September and October were very hot.

In North Gujarat there was scarcity of rainfall for rice planting and tobacco planting. Bhal tract had no rabi rains and wheat crop was very poor ; whilst the late rains were good in Panch Mahals which saved the tract from famine due to the failure of maize crop. The heavy October rains in Broach spoiled the crop of lang, wheat etc. which though re-sown did not fare well. These October rains also affected the crop of cotton in Broach as well as Surat tract. However the winter being specially mild and clouded, cotton crop continued to grow longer and the yield was good in Broach and Surat tract. The ginning percentage of cotton in Surat tract was 2 per cent. higher than normal. But such a winter brought about rust in wheat which affected the development and yield of wheat materially in Panch Mahals and Broach.

Locust appeared throughout the Division but did no damage. Out-break of rinderpest in January was severe and killed 15 to 20 per cent. of cattle particularly buffaloes.

III—Research and Experimental Work.

5. The work done by different sections is summarised under the following heads :—

- (1) Research on Crop Breeding ;
- (2) Research on Crop Pests ;
- (3) Experimental Station Work ;
- (4) Experimental trials in cultivators' fields.

(1) RESEARCH ON CROP BREEDING.

Surat District.

6. *Cotton.*—The types 1027 A.L.F., Surat 5¹, IA Long Boll and White Flower were tested in ten random replications, each plot being of 1.63 gunthas. The results are as under :—

Type	Yield of seed cotton per acre in lbs.	Ginning percentage	Yield of lint per acre in lbs.	Highest suitable warp counts as tested in Matunga Laboratory	Length of staple in inch	Fibre weight in millionth of an ounce
1027 A.L.F. ..	564.6	39.2	221.3	29s	0.93"	0.201
Surat 5 ¹ ..	564.2	42.0	236.9	23s	0.91"	0.186
IA Long Boll ..	645.9	41.9	270.6	23s	0.89"	0.206
White Flower ..	579.9	38.6	223.8	30s	0.91"	0.191

From this the following points are clear :—

(A) This season IA Long Boll has yielded the highest, just as White Flower did last season.

MO Q 55—10a

(B) This season the ginning percentage is higher in all cottons, particularly Surat 5¹ is equal to IA Long Boll in ginning.

(C) In spinning value Surat 5¹ has come down very much compared with previous years, though staple length in Surat 5¹ and 1027 A.L.F. is about alike. White Flower has maintained its high spinning and IA Long Boll has fallen a little.

7. The cross between 1027 A.L.F. and Nandyal 14 has been rejected while only one plant from the cross 1027 A.L.F. × Aligarh 19, is retained for further selection. The selection made from the cross 1027 A.L.F. × Goghari A 26 are promising for high ginning percentage. The crosses between 1027 A.L.F. and Jayawant and IA Long Boll and between White Flower and Comilla were grown in F₁ generation.

8. The Cotton Breeder produced 155 lbs. of selfed seed of 1027 A.L.F. and 1017 lbs. of pure seed of 1027 A.L.F., of which 52½ lbs. selfed and 1017 lbs. of pure seed were supplied to the Surat Farm for sowing and 98 lbs. of selfed seed of 1027 A.L.F. were given for District tests. He also continued to grow some pure strains of different types for observation.

9. *Jowar*.—The most promising type Budh Perio 53 was again tested in ten replications in comparison with Local Perio. This season the Local Jowar was in full flowers when there was torrential rain by the end of October; whilst Perio 53 was just flowering, thus the latter yielded 46 per cent. more in grain and 8 per cent. more in fodder. For the last five years Budh Perio 53 has yielded on an average 19 per cent. more in grain than Local, thus these tests will not be continued. 6,747 lbs. of the purified seed has been distributed during the year. Some pure strains of other types are also maintained pure by selfing for general observations.

Broach District.

10. *Cotton*.—Attempts to breed wilt resistant types combined with good staple and ginning percentage of about 40 and above are continued by exploring the local material by unit selection and by building up a new type by crosses.

11. The crosses made with outside cottons have been left out; while the crosses made between local types will be grown next year for further selection. The composite crosses done between wilt resistant types and F₁ cross will be used for selection so as to have better material for selection. Promising selection from the old cross Broach 9¹ and Broach Deshi 6 is continued. Broach Deshi 8 continues to show very high wilt resistance, high yield and high spinning value. Its low ginning requires to be improved by crossing. Goghari A 26 shows resistance to a degree by which the yield is not much affected.

12. *Jowar*.—Selections Nos. 10, 12 and 8 were treated in five random replications with Local. No. 8 maintained its significant superiority; while Nos. 10 and 12 yielded equal to Local. The grain of No. 8 was

slightly inferior to that of Local, though it was superior to that of No. 12. Local consisted of seven samples two from Nikora, two from Chamargam and three from Broach market.

13. Natural cross fertilisation study was continued and it was found to vary from nil to 2.2 per cent. and was only in the North and Eastern directions within ten yards.

Kaira District.

14. *Tobacco Work at Nadiad.*—Gandiu No. 6, 46 and 47 were compared with Local Gandiu in five replications, each plot being 0.97 gunthas while Piliu Nos. 28 and 45 were compared with Local Piliu in eight replications, each plot being 0.62 gunthas.

In Gandiu comparison, No. 6 was the best, No. 47 being second and significantly superior to Local and No. 46; No. 46 being not significantly superior to Local.

15. In Piliu comparisons, Nos. 45 and 28 are being significantly superior to Local, both being better by nearly 11 per cent. Between 45 and 28, there is practically no difference.

Pure seeds of Gandiu 6 and Piliu 28 are being distributed to replace the respective Local varieties.

16. *Crosses.*—The crosses mentioned in paragraph 18 of the last year's report were selected again in the season but most of them proved late and had rather thin leaves. They are still impure and need further sorting out.

The cross between Gandiu 6 and Piliu 28 has been made with a view to combine quality and high yield. Several fresh selections from Gandiu and Piliu have also been made.

17. The experiments with a view to investigate, the effects on yield and quality by keeping 10, 12, 14, 16, 18 and 20 leaves at the time of nipping was continued. Contrary to previous year's results, the yield is found to be high with 10 to 14 leaves and the quality together with yield was the best with 10 leaves.

18. *Bajri at Nadiad.*—The selections mentioned in paragraph 21 of the last year's report were grown and further purified and selected. On the whole these selections are late in flowering. The strain maintained give high yield of straw in particular and of grain in general than the Local Nadiad seed. This season six selections were pure for green sheath character, the percentage of red sheath plants in the selections is much higher than in the Local seed.

19. *Castor at Vina (Nadiad).*—As a result of last year's trial, three selections, viz. 22, 52 and 54, now re-named S-5, S-9 and S-18 are maintained and tested. No. 57 was not tested as the seed was not available. Three more selections, viz. S-2, S-7 and S-19, were also tested as recommended by the Economic Botanist to Government of Bombay,

Poona. Thus in all these six selections were tested in four replications of two gunthas each with the following results :—

Selection Nos.	S-2	S-5	S-7	S-9	S-18	S-19
Yield in lbs. per 8 gunthas from four replications ..	125.97	150.62	85.69	100.50	97.37	125.37

Now it is decided to grow twelve selections in replications. In these tests no Local variety has been tested.

Ahmedabad District.

20. *Cotton at Viramgam.*—B.B.M., Wagad 8, K4 and C.B., were compared in five random replications with Local. The area of each plot was 1.704 gunthas. In yield Wagad 8 is the best and it is higher by 15 per cent. than Local and next stands B.B.M., both being significantly superior to Local. In ginning per cent. also Wagad 8 is the best being 3.1 per cent. higher than Local against 1.2 per cent. superiority of B.B.M. In spinning value No. 8 is superior to B.B.M. by 2 counts but is equal to Local.

Thus so far No. 8 is the best and has been consistently giving better results. The strain is being tested in the district on cultivators' fields. Out of the ten selections mentioned in paragraph 25 of last year's report, three have been retained for further selection.

21. Out of the three crosses mentioned in paragraph 26 of last year's report 12 plants from Taskhant cross, two cultures from the back cross with Wagad 8 and eight cultures from the Wagad 8 × 1027 A.L.F. have been retained for further selections.

(2) RESEARCH ON CROP PESTS.

• 22. *Katra Control Work at Nadiad.*—The attack during the season was very bad and the following were the results of the observations and tests :—

(1) The pest is carried over from one season to the other in the pupal forms existing in the first 8" to 10" of soil, on head-lands particularly near the hedge.

(2) Moths begin to emerge within 24 hours of the rain that wets 8" to 10" of soil. Maximum emergence being from two to ten days after wetting 8" to 10" of soil.

(3) Petromax lamps are superior to Kitson lights and when they are placed along the hedge at a distance of 50' from head-land on the basis of one lamp for every 2.5 acres they trap a large number of moths.

(4) In order to have complete control over this pest migration of caterpillars from head-land requires to be checked by dusting Sodium fluosilicate or by other means ; but during the year for want of Sodium

fluosilicate its effect by dusting to control pests by killing emerging caterpillars on the border land could not be investigated.

(5) Trials to protect seed beds by means of a smooth surface of a cloth were promising on a small scale and require further verification.

23. *Wilt*.—*In Broach District*.—Both the Fusarium and Root-rot were found in black soil; while Root-rot alone was found in Goradu soil. Where the black soil was heavy, Fusarium was heavy but when the two tracts merged both Root-rot and Wilt were observed. On Broach Farm both the diseases have been reported to be present. On the Baroda Farm and Northwards only Root-rot was reported by Dr. Mundker. Root-rot was specially virulent this year in North Gujarat.

(3) EXPERIMENTAL STATION WORK.

(a) *Surat Agricultural Station.*

24. *Season*.—The total rainfall was slightly above normal, viz. 41.28 inches, but the distribution was irregular with heavy and continuous rains in July and half of August and a good break from 12th August to 8th September. The special feature of the season was the torrential rains with storm on 30th October which lodged down the crop of Jowar heavily, as a result the quality was rather inferior. The winter was mild and cloudy which with good rains increased the yield of Kapas above normal and gave exceptionally high ginning per cent. of lint.

25. *Cotton*.—The area under cotton was 56 acres and 37 gunthas. The average yield of Kapas was 642 lbs., which was the highest on record, just approaching the season 1920-21. The average yield of 1027 A.L.F. grown on an area of 54 acres and 27 gunthas was 606 lbs., out of which the resultant purified seed 23,367 lbs. was distributed in selected villages of Athwa, Bardoli and Vijalpore Groups for further multiplication.

26. 1027 A.L.F., Surat 5¹ and White Flower were tested in three replications. The average yield calculated on the basis of pure plants was 489, 500 and 503 lbs. per acre respectively. The ginning outturn was also 36.0, 38.2 and 35.2 respectively.

Opening of Surat 5¹ was specially shown to the cultivators of Surat tract and they did not consider opening defective in any way.

27. *Jowar*.—The area under Jowar (Budh Perio 53) was 47 acres and thirteen gunthas yielding on an average 1,152 lbs. per acre, which is nearly similar to the season of 1907-08. 6,747 lbs. purified seed was distributed this year.

28. *High ridges vs. Low ridges*.—With the object started in paragraph 34 of last year's report the experiment to compare crops on high ridges and low ridges and flat was to continue; but unfortunately the Acting Farm Superintendent failed to prepare high ridges and the original experiment was entirely upset. The experiment as it was carried out became a spacing experiment on ridges and flat.

Three feet ridges gave significantly better yield than five feet ridges.

29. *Manurial Experiment.*—The Experiment described in paragraph 35 of the last year's report was continued in five replications in Latin Square by growing cotton on ridges as well as on flat.

In the case of crop on ridges the results were significantly superior for 20 lbs. Nitrogen in the form of Sulphate of Ammonia and Mixture as well as for 15 lbs. Nitrogen Mixture. In the case of crop on Flat, the results were significantly superior for 20 lbs. Nitrogen in the form of Sulphate of Ammonia as well as Mixture. The average results were as under :—

Treatment	Average yield per plot of 2-5 Gunthas : Cotton grown on	
	Ridges	Flat
Control	29.25	31.7
20 lbs. Mixed Nitrogen	33.45	37.05
20 lbs. Nitrogen Sulphate of Ammonia	36.05	38.05
15 lbs. Nitrogen do.	32.05	32.85
15 lbs. Mixed Nitrogen	32.45	33.90

30. As regards Jowar crop following cotton, manured according to the Scheme, the yield was noted to see the residual effects as the manure was probably not used owing to want of rains after application. It is found that the yield of Jowar grain was significantly higher only in the treatment of 20 lbs. Mixed Nitrogen applied to cotton on ridges. However in the case of fodder yield the results were significantly higher for 20 lbs. of Mixed Nitrogen as well as Sulphate of Ammonia and also for 15 lbs. of Nitrogen as Sulphate of Ammonia. The actual results were as under :—

Treatment	Average yield of Jowar per plot following cotton grown on			
	Ridges		Flat	
	Grain	Fodder	Grain	Fodder
Control	92.87	159	107.62	192
20 lbs. Mixed Nitrogen	107.43	226	113.62	297
15 lbs. Nitrogen Sulphate of Ammonia	97.31	201	116.7	266
20 lbs. Sulphate of Ammonia	104.50	215	118.00	325
15 lbs. Mixed Nitrogen	99.87	187	104.03	249

31. An experiment was started to see the effects on yield by increasing the number of plants by dibbling according to Egyptian method, so as to have the same area in an equilateral form even though dibbled $3' \times 2\frac{1}{2}'$ in comparison with $3' \times 3'$ square. The results were not favourable for the new system.

32. An experiment to see how far the yields of staple crops can be increased by improved tillage, higher dose of manure and the change

in rotation, is being conducted according to Government Resolution No. 8241 of 20th August 1907, with slight changes since last 17 years.

Group A.—Represents a good cultivator who does not possess an iron plough. In this group six plots have been set apart, each plot measures $\frac{1}{2}$ an acre. Crops grown are—Jowar, Cotton and Til-Tur. Every plot is to be cropped with Til and Tur once in six years. Farm yard manure is to be applied at the rate of 18 cartloads per acre once in six years and ploughed in with the country plough during monsoon, after Jowar is harvested and before cotton follows.

Group B.—Represents an ordinary average cultivator. In this group two plots have been set apart, each measuring one acre. Cotton and Jowar rotation is followed. Farm yard manure at the rate of 9 cartloads per acre is to be applied once in six years.

Group C.—Represents a good cultivator, who does possess an iron plough. The cropping is similar to that of Group A. Farm yard manure is to be applied once in six years just before ploughing at the rate of 18 cartloads per acre. Ploughing is to be done with an iron plough after Jowar is harvested and before cotton follows.

The following were the average results of the last 17 years in these three Groups :—

Name of the crop	Average yield in lbs. per acre in Group		
	A	B	C
Cotton	454	415	517
Jowar—Grain	714	620	780
Fodder	1,551	1,404	1,842
Til-Tur—Til	170	..	173
Tur	114	..	124

These results indicate that the higher yields of Cotton and Jowar are obtained by both A and C Group cultivators, in comparison with B; C being the best of all. C Group cultivator had an extra advantage of wider dibbling of cotton and of wider sowing of Jowar over A cultivator since 1922-23. The following were the results of these two periods :—

Period		Average yield of seed cotton per acre in lbs.			
		A		C	
I	1914-15 to 1921-22	417	..	439	..
II	1922-23 to 1930-31	486	..	589	..
		Grain	Jowar— Fodder	Grain	Fodder
I	1914-15 to 1921-22	644	1,537	700	1,808
II	1922-23 to 1930-31	767	1,564	852	1,861

From the above table, it is clear that in the second period, the yield of cotton in case of C Group cultivator is much higher; while increase of yield of Jowar is not so high. This may be more due to wider dibbling of cotton than to the cumulative effects of deep ploughing, which has not shown very great increase in the first eight years. The detailed results of this experiment are described in the Experimental Record.

33. *Breeding herd on Surat Farm.*—The strength of the herd on 1st April 1931 was 133 against 114 on 1st April last year. Four bulls were issued in the District for breeding purposes. Three bulls, i.e. one each from Anpurna, Prayag and Popti, i.e. (good milk yielding families) were used for service to correct defects in feet or early maturity or regular breeding in the herd. Attempt is made to follow line breeding to increase milk yield. General health of cattle was very well maintained, there being only one death of a calf. This season 34 young breeding bulls were treated with Serum simultaneous for protection against rinder pest and there was no casualty.

The total milk yield during the year was 84,673½ lbs. The annual average per head was 2,794 lbs. These figures are slightly higher than those of 1929-30 and much higher than that of last year.

(b) *Amalsad Farm.*

34. As a result of financial stringency the Farm has been closed after the span of 15 years.

As a result of opening of this Farm the following permanent improvements have been made in Sugarcane cultivation of the tract.

35. *Introduction of new varieties of canes.*—11 varieties were tested, 7 thick and 4 thin canes. The four thick varieties, viz. Stripped Mauritius, Manjav, J. 247 and Red-sport are the favourites of the ordinary Malbari cane growers and have largely replaced Malbari. From the thin canes Co. 210 and Co. 213 are preferred where there is scarcity of water or where the water is brakish.

36. *Wider planting of canes.*—In this tract, the whole canes were drilled through a heavy plough at a distance of 18" to 24" between rows. Now as a result of the wider system of planting at Amalsad the distance has increased from 30" to 36".

37. *Increased use of Sulphate of Ammonia.*—As a result of the visible effect on the crop by the use of this manure as a top-dressing on Amalsad Farm, it is largely used in that tract and by systematic propaganda it is likely to spread in Bulsar and Pardi and in course of time will be the general practice with cane growers.

38. As a result of the successful working of the improved Poona furnace with some modifications in the last four years on Amalsad Farm, the beginning has been made in the construction of the improved kinds of furnaces, viz. single or double ones in Pardi and Jalalpore Talukas. They have been found to be economic and the improvement is likely to be adopted in future.

(c) *Dohad Farm.*

39. *Maize*.—The experiment referred to in paragraph 44 of last year's report was repeated. The results were vitiated owing to the heavy rain at the time of flowering and as a result there was no yield.

40. *Groundnut*.—The crop yielded on an average at the rate of 1,296 lbs. per acre against 860 lbs. of last year.

41. *Paddy*.—Jirasal and Anklo varieties were grown on the Farm and yielded 2,788 lbs. and 790 lbs. per acre respectively. Anklo was grown as rain crop. In a series of Manurial Experiments on Rice, San green manuring gave better results by 17 per cent. than Farm yard manure alone and Farm yard manure combined with Sulphate of Ammonia and also better than Castor cake alone at 400 lbs. per acre.

42. *Cotton*.—Banilla Cotton was sown during the year and it gave an average yield of 760 lbs. per acre. Seed appeared to be a mixture. No comparative monetary results could be ascertained as the prices were abnormally low and as the Maize crop had failed.

43. *Wheat*.—Six Wheat varieties were grown during the year of which Pusa 4 and Wagia continued to give better results. The average yield of Wheat was 1,122 lbs. per acre against 997 lbs. of last year. In the spacing experiments of Wheat, the drilling at a distance of 15" is the best and is significantly superior by 10 per cent. to that of sowing with plough and drilling at a distance of 18".

44. *Gram*.—In all about 14½ acres were grown under it and it gave an average yield of 771 lbs. per acre.

45. *Seed Distribution*.—During the year the following seeds were distributed:—

	lbs.
1. Maize	8,240
2. Spanish Peanut	5,499
3. Pusa 4 Wheat	10,901
4. Gram	5,183
5. Jirasal Rice	157
6. Anklo Rice	560

(4) *Experimental Trials in Cultivators' Fields.*

46. *Cotton*.—Wagad 8 was compared with Local Wagad at 4 places in Dholka and at 3 places in Viramgam; out of these trials, two tests in each of these Talukas is comparable. In spite of early cessation of rains Wagad 8 gave higher yield of Kapas varying from 6·4 to 24 per cent. as well as higher ginning per cent. of lint by about 2·0 varying from 0·7 to 3·3 per cent.

47. *Jowar*.—Rabi Jowar strains No. 12 and 8 were tested at three places on eight plots in Broach District. No. 8 was tested in six plots with Local and No. 12 was tested in two plots. In all the tests No. 8 and No. 12 yielded higher by 3 to 40 per cent. However as regards Fodder yield No. 8 yielded low from 0.4 per cent. to 10 per cent. and 51 per cent. in one case. No. 12 yielded fodder equal to Local.

48. *Wheat*.—Pusa 4 was tested at three places at Varod and at three places in Limdi and yielded 7 to 15 per cent. better than Wagia. This type is now recommended for the Panch Mahals and the area is increasing.

49. The strain No. 224 from the Crop Botanist to Government of Bombay, Poona, was again tested in Dholka Taluka and gave higher yield from 5.6 to 18.5 per cent. and is popular on account of earliness and superior grain quality in comparison with Dhola-katha. When tested with Red-katha, it yielded 16 per cent. lower but owing to superior quality the price was better by 33 per cent. thus it was better economically.

50. *Rice*.—Strain No. 79 from Karjat was tested in Dholka with Sutarsal and Utavli. It was a week earlier and yielded 27.5 and 25.5 per cent. better respectively. However as it was susceptible to brown spot disease, the test will be taken with No. 184 in this Taluka.

No. 79 is also introduced in Surat District but its expansion has been limited due to the following reasons :—

It requires thicker planting thus higher seed rate is required.

It sheds more grains at maturity and thus requires to be handled just in time.

For home consumption, the quality of No. 79 is not appreciated.

51. Kolambo No. 42 was tested with Sutarsal in Prantij on Canal area. It was found late by 20 days and required two more waterings. The yield was more by 4 to 8 per cent. but the quality is very good and fetches 30 per cent. more price hence it is liked. In future it will be tested with Jirasal.

52. *Groundnuts*.—The Local variety Magadi in the Western Panch Mahals was tested with Big Japan. In preliminary tests Magadi have given higher yield varying from 12 to 41 per cent. Systematic trials will be taken from next year.

53. *Manurial Experiments*.—Tests were taken in Ahmedabad District with irrigated Dhola-katha by applying 112 lbs. of Sulphate of Ammonia and with irrigated Chandushi type by applying Sulphate of Ammonia and Superphosphate. In the former the yields were higher from 6 to 16 per cent. and in the latter they were higher from 14 to 28 per cent. In the Panch Mahals also with dry crop the trials were taken with Sulphate of Ammonia and Sodium Nitrate and gave higher yields varying from 4.8 to 22 per cent. with the former and with the latter manure from 7.2 to 28 per cent. In the season there were good rabi rains.

IV—Organisation.

54. *Divisional Board*.—Three Meetings were held under my Chairmanship and afterwards the Assistant Registrar, Co-operative Societies, N. D., Surat, called the meetings.

The Board as usual controlled and guided the work of the Propaganda staff and Taluka Development Associations.

55. *Taluka Development Associations*.—There were six Taluka Development Associations during the year, viz. Chorashi, Pardi, Jalalpore, Anand, Borsad and South Daskroi. All of them did very useful work in the distribution of seed of improved crops and manures.

56. *Agricultural Associations*, Matar, Mehemedabad, Thasra, Kapadvanj, Broach and Prantij were dormant. The Agricultural Association, Nadiad, requested the Deputy Director of Agriculture, Gujarat, to organise a Roze (Nilgai) killing Campaign and contributed Rs. 50. 31 Roze (Nilgai) were killed by a party of Sikaries under the Pig-killing Officer, Poona, within a fortnight.

57. *Agricultural Co-operation*.—The District Agricultural Overseers are trying to work their propaganda through the Co-operative Credit Societies wherever possible. In the Panch Mahals, the pure seed of Spanish Peanut nearly 38,000 lbs. was stored in the Co-operative Stores in the Eastern Mahals. Also 34,600 lbs. of Pusa 4 Wheat seed was distributed from the cultivators' crops. Similarly pure seed of Gram, Wheat and Spanish Peanut to the extent of 16,000 lbs. was distributed through the Societies.

58. *Cotton Policy in Surat Tract—Tests of Commercial Samples of Surat Cottons*.—Dr. Turner of the Technological Laboratory took a review of the tests of Surat Cottons particularly Selection IA and 1027 A.L.F. and reported that there is very little difference in the spinning value between these two cottons and the prices obtained show that 1027 A.L.F. gets only 4 per cent. higher value than Selection IA.

59. In view of this the Indian Central Cotton Committee decided that a representative Committee of the Department of Agriculture, Growers, Mills and Trade should take proper samples of Commercial Cottons and get them tested by the Matunga Laboratory and the Mills in Ahmedabad and Bombay. Accordingly samples were taken and tests were made with the following results. One bale from each of the Athwa 1027 A.L.F., Athwa, Surat 5¹ and Sonsak impure Selection IA was sent to Tata Mills, Bombay, and Sheth Kasturbhai's Asok Mills, Ahmedabad. The losses in the Tata Mills were rather very high in all the samples. *Surat 5¹ was valued very low by Tata Mills due to weakness*, viz. at Rs. 20 on Broach while 1027 A.L.F. and Selection IA were valued at Rs. 70 and Rs. 50 on Broach respectively. In Asok Mills, Ahmedabad, Surat 5¹ gave tests similar to 1027 A.L.F., while Sonsak Selection IA spun about the same being slightly inferior, all cottons spinning 22^s warp. Besides Asok Mills reported that it was not profitable to spin 1027 A.L.F. higher than 22^s warp and 32^s weft. It seems merchants

assign much higher value to the feel of cotton and Surat 5¹ was valued best, though *Tatas Mill* valued it very low owing to its soft and weak fibre and Ahmedabad valued at as good as 1027 A.L.F. This shows the traders' value is not confirmed by the Mills and it seems the trader assigns greater value to the feel than justified by the spinning value of the cotton in Mills. The real issue between selection IA and 1027 A.L.F. is (1) what is the spinning value of each in the mills and (2) what is the money value assigned to the spinning difference obtained in the mills?

59A. *Cotton Transport Act.*—This remained in force in the amended form and as no barrier was put on the river Tapti, the seed of Sonsak Selection IA is spreading to a very large extent. The Government has also protected the cotton area comprising the North of the river Narbudda up to the river Mahi to check the inroad of the inferior Cotton coming inform beyond this tract. Through the Cotton staff Cotton seed samples in Surat District were collected from local Gins and were grown and analysed by the Cotton Breeder, South Gujarat, Surat, and it is concluded that the natural spread of 1027 A.L.F. cannot be depended upon.

V—Propaganda.

60. During the year the area of 1027 A.L.F. Cotton grown under the supervision of the Department was 13,836 acres. The total quantity of Kapas obtained was only 4,343 Bhars (Bhar = 924 lbs.) even though the yield was above normal because the work at Navsari was more disorganised than anywhere else and most of the cultivators there sold off their Kapas freely. 4,343 Bhars of Kapas was ginned at five centres under the supervision of the Cotton staff and yielded 1,743 candies of lint (Candy = 800 lbs.) which was sold in the open market at a premium varying from Rs. 3 to Rs. 23 per candy. The premium was particularly low from April as the Egyptian Cotton was even offered at lower prices. The quantity of Kapas required for one candy lint varied from 58 maunds at Hansot, 58½ maunds at Athwa, about 61 to 61½ maunds at Bardoli and Navsari Groups. The greater quantity at Navsari groups seems to be due to impurity and Local conditions. As a special measure to guarantee purity, it has been decided to concentrate the area from Farm grown seed only in a single village in each group and if the resultant seed be insufficient for that group, as in Bardoli group, two villages may be sown with the Farm seed by the supply of greater quantity of seed from the Farm.

61. The total quantity of seed purchased from the Director's Personal Ledger Account was 2,403,120 lbs. out of which 1,531,020 lbs. was supplied to Rajpipla State, Chhota Udepur State and the remaining quantity of 872,100 lbs. was distributed through 20 seed Depôts at suitable centres (though the whole was not sold as seed). There were five Depôts at Navsari, one in Surat Group besides the Surat Farm, six in Bardoli Group, two in Olpad and six in Ankleshwar-Hansot Groups.

62. The prices of Cotton ranged very low from Rs. 231 to Rs. 301 per candy. The rate realised per Bhar of Kapas varied from Rs. 103-4-0 in Bardoli to Rs. 120 for Athwa Group; Navsari Group Cotton being not yet sold.

63. *Cotton in Ahmedabad District.*—Attempts to distribute the seed of Wagad 8 have not been made but due to natural spread, it is grown on 1,500 acres.

64. *Tobacco No. 6.*—Owing to trade depression, the area under Tobacco has gone down. There was no demand for more seed of No. 6 as the cultivators had grown their own seeds. The type No. 6 is specially suitable for “Ponkio Bhukha” as an irrigated crop; 8 lbs. of seed was distributed this year.

The cultivators like Piliu No. 28 as it gives better colour, 30 lbs. of seed of this type was distributed.

Gandiu No. 6 was much less affected by Virús disease than 46 and 47 of Gandiu variety. The foreign Tobacco were severely affected.

65. *Groundnuts.*—In the Panch Mahals this crop is popular, the Spanish Peanut variety in the Eastern Mahals and the Magadi or impure Big Japan in the Western Mahals. In the Eastern Mahals 38,000 lbs. of Spanish Peanuts have been stored in the Co-operative Store.

66. *Wheat.*—Nearly 41,000 lbs. of Wheat seed of Pusa 4 (including 6,700 lbs. from Dohad Farm) was distributed in co-operation with the Co-operative Department in the Eastern Mahals.

67. *Rice.*—Kolambo No. 42 was grown on 400 acres in South Daskroi but 100 acres could mature due to failure of Canal supply. It is being extended in Prantij Taluka under Canal, though it is late and requires two more waterings, but is popular on account of superior quality.

68. *Miscellaneous Crops.*—Sugarcane variety Co. 213 wants only 25 waterings in a year and has good yield and is safe against damage by wild animals and so is spreading in the Panch Mahals. It was first introduced from Amalsad Farm, closure of which will really affect the further trials of new varieties for the garden cultivation on well irrigation in Gujarat.

69. *Shows and Demonstrations.*—Owing to financial stringency nothing substantial was done, but several small demonstrations were held in the Panch Mahals and Broach for showing the use of implements. Two Horticultural Demonstrations were also held, one at Dholka and the other at Nadiad in August and September for a week and three days respectively for preservation of Lime juice, growing fruit trees, preparing jelly of Guavas etc.

70. *Controlling Spotted Bell-worm Pest on Cotton.*—As a result of the investigations carried out at Surat from the Funds of the Indian Central Cotton Committee, it is concluded that the pest can be controlled by (1) preventing the carry over of these insects from one season to another by uprooting Cotton stalks as soon as the pickings are over and (2) by not supplying the favourite food, viz. Bhinda during Summer and in early rains and also the Kasaki. The three years' experiments at Surat

gave an average increase of 47 per cent. in yield of cotton. It is essential that these operations should be carried out over a very large area of about 500 square miles. For this purpose preliminary educative propaganda is undertaken in three Talukas of Broach, Wagra and Amod with the help of one Cotton Entomologist and four Boll-worm Control Officers provided from the funds of the Indian Central Cotton Committee, Bombay.

VI—Agricultural Services.

71. *Distribution of Seed.*—Important seeds distributed by the District staff were 9,136 lbs. of Cotton seed in Broach District. 1,000 lbs. of Pusa 4 were distributed in Viramgam. 38,000 lbs. of Spanish Peanut, 41,000 lbs. of Pusa 4 and 4,000 lbs. of Gram in Panch Mahals and 26,000 lbs. of Wheat No. 224 for Bhal tract have been reserved for distribution. Besides 95,000 sets of Co. 213 were also distributed for planting in Panch Mahals.

72. *Horticultural work.*—In Kaira and Dholka the demand of grafts of fruit trees is increasing and 2,122 grafts were imported. 370 Lime plants, 120 Guavas and 67 Mango grafts were distributed in Broach.

73. *Distribution of Manure.*—127 tons of fertilizers were distributed in North Gujarat; most of it was in Kaira and more than one ton in Broach District. Permits for 389 maunds (Bengali) of denatured salt were issued. The use of artificials is likely to decrease owing to depression.

74. *Distribution of Improved Implements.*—Improved implements worth Rs. 4,512 were supplied to cultivators consisting chiefly of Malwa ploughs, Persian Wheels and Wheat Threshers. The hire charges of implements received from the Panch Mahals were Rs. 27-4-0.

75. *Distribution of Copper Sulphate Packets.*—The total number of packets distributed were as under :—

Surat Farm	..	..	102
Panch Mahals District	..	..	100
Dholka Taluka	..	..	100
Broach District	..	..	850
Ankleshwar Taluka	..	..	19
Total			1,171

This work has got a set back due to Civil Disobedience movement and requires to be revived by concentrating the work intensively and by using Sulphur Dust which is easy to use and cheaper.

76. *Distribution of Poison Packets.*—The Entomological Assistant, Gujarat, distributed 200 packets of White arsenic, the demand increased from the Panch Mahals for controlling field rats. Also 213 packets of Strychnine hydrochloride were distributed.

77. *Trial of Sulphur dusting for the control of Mango-hoppers.*—Surat tract has a very valuable crop of Mango yielding lakhs of rupees, Bulsar and Amalsad being the chief Mango centres. It has been noticed for the last three years that the crop suffered severely from Mango-hoppers and the Loranthus pest so it was decided to try Sulphur dusting to control hoppers and take up intensive propaganda against Loranthus for which a leaflet is under preparation.

78. *Cattle Breeding.*—There were 7 Breeding Bulls in the non-intensive breeding zones in Gujarat and these were inspected by the District staff.

The distribution of the Bulls according to Districts was as under :—

District	No. of Bulls
Ahmedabad	1
Kaira	1
Surat	5
Broach	..
Panch Mahals	..
	—
Total ..	7

79. *Boring.*—By June 1930 all works were stopped owing to monsoon and the staff was engaged in cleaning and overhauling machines. Before the work could be restarted in October 1930, orders were received to close the Boring works and discharge the staff. The temporary staff was accordingly discharged from 1st November 1930 and so no work was done during the year under report.

80. *Mechanical help.*—The Mechanical Assistant erected three new Pumping plants during the year and as usual attended 67 more or less minor works, such as inspection of cultivators' plants and repairing where necessary. He also gave lectures on oil engines to the students of the Vernacular Agricultural Schools.

VII—Agricultural Education.

81. Though Godhra and Surat Vernacular Agricultural Schools were much in demand, owing to financial stringency both the schools of Godhra and Surat were closed down. In Godhra School, the right type of students from the backward class of Dharalas were now coming and it is misfortune that the school had to be closed. There were 26 students in each of the Godhra and Surat Schools, 17 and 13 in the First year and 9 and 13 in the Second year in Godhra and Surat Schools respectively. Out of these students, in the final year 10 boys from Surat and 7 boys from Godhra School succeeded. From Surat School two students could not appear in the examination. The Boarding charges per boy per month come to Rs. 5-15-0 at Godhra, less than half to what it was previously, and Rs. 7-13-0 at Surat School.

VIII—Publicity.

82. The Broach Quarterly Magazine continued its publication under the auspices of the Broach District Agricultural Association and the staff contributed articles of Agricultural interests. A new leaflet on "Cultivation of Groundnut in Gujarat" was prepared and published. Almost all the leaflets revised during the year were translated into Gujarati for publication. A Bulletin No. 164 of 1930 on "Study in Intensive Farming near Poona under Canal Irrigation" was prepared by Mr. B. S. Patel, Deputy Director of Agriculture, Gujarat, with the help of Mr. H. M. Desai, Lecturer in Agriculture at the College of Agriculture, Poona. In addition to the above, several articles were contributed by the subordinates to the weekly Vernacular papers.

IX—Miscellaneous.

83. *Personal.*—There were many unavoidable transfers due to inter-divisional transfers and closure of three Institutions as a result of severe retrenchment in this Division. On the whole the staff worked satisfactorily with few exceptions.

B. S. PATEL,

Deputy Director of Agriculture,
Gujarat, Surat.

Surat, the 24th August 1931.

APPENDIX G.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, KONKAN DIVISION, RATNAGIRI, FOR THE YEAR
1930-31.

Staff.

Mr. V. V. Gadgil continued to be in charge of this Division throughout the year. The staff of this Division consisted of—

- 16 Graduate Assistants,
- 13 Non-graduate Assistants, and
- 5 Kamgars engaged in District Propaganda work.

The Boring Section consisted of 1 Boring Assistant, 10 Mechanics and 7 Mates which was discontinued by the end of October 1930 and only one Fitter is now working in the Konkan Division. On account of the abolition of the Jambul Agricultural School, one Graduate Assistant, one Assistant teacher and one fieldman were retrenched from 1st April 1931.

The work of the Konkan Division is summarised under the following heads :—

- I. Research work.
- II. Propaganda Work.
- III. Agricultural Organisation.
- IV. Agricultural Service.
- V. Agricultural Education.

Season.

2. The total rainfall recorded during the year at the headquarters of the four districts was as follows :—

	Inches.
Kanara	95·61
Ratnagiri	96·15
Kolaba	93·10
Thana	98·53

In Kanara District regular rainfall commenced from 8th June 1930 and in Ratnagiri about the 10th of June. In Kolaba and Thana districts regular monsoon started on the 15th of June. In the beginning the rainfall was very moderate throughout Konkan, but by the end of June heavy showers were recorded in Thana, Kolaba and Ratnagiri which affected the rice seedlings in the seed beds. In Kanara District rainfall was well distributed and there were no floods unlike the past. In the month of July there was scarcity of rain in Thana and Kolaba and the transplanting operations had to be prolonged. In the month of August there were light showers which were just sufficient to maintain the condition of the crop and afterwards there was a long break of three weeks which told heavily upon the growth of the crop. There were again heavy showers of rain in September coupled with high floods which affected the grain formation. Late rains received in October and

November also damaged the cut rice crop, and prolonged the sowing of rabi crops. On the whole the season for both the *kharif* and *rabi* crops was not very favourable though the total rainfall was slightly above the average.

3. During the year under report there were no insect pests of any serious nature and the kanne pest (fly pest) on rice appeared late in the season and consequently caused very little damage to the standing crop. The mango crop was very poor except in the coastal tract of the Ratnagiri District which was somewhat affected by hoppers and mildew in the months of January and February. The attack of koleroga on betelnut was sub-normal and the spraying arranged on a large scale saved a good deal of the crop. The leaf curling disease called *murda* had affected the chilly crop very seriously and had reduced the yield by 30 per cent. Locusts also appeared in a few villages of the Kolaba District but no serious damage was done by this pest.

General depression.—On account of the general fall in the prices of all commodities it has become extremely difficult to introduce the artificial manures and implements as they are not sufficiently remunerative. On the other hand the reduction in the wages are very small compared to the reduction of prices in the food grain. Even the money-lenders and sowkars consider it risky to advance any loan for the cultivation of stable crops and the effect of all this depression is likely to be seen in future cultivation. The general indebtedness has been increased and in some parts of the Kanara District great difficulty has been felt in collecting the revenue. The poor cultivators are not in a position to hold out their produce until better prices prevail; and as a result almost all the produce has passed in the hands of merchants and sowkars at the cheapest possible rate. If the present depression continues, the cost of cultivation and the value of the produce will be automatically settled, but this settlement will take a heavy toll at the cost of poor cultivators.

I—RESEARCH AND EXPERIMENTS.

(1) Rice.

4. *Rice breeding and selection.*—As mentioned on page 159 of the last year's report, all the breeding and selection work was conducted on new lines according to the minutes of the Crop Research Committee. At the Ratnagiri farm, the trial of the early strain of *patani* No. 6 was conducted by A. B. B. A. method with local *patani* as a check in 10 replications. This strain has given 15 per cent. more yield over the local check and the results are significant. The result will be again confirmed, but a beginning will be made to test this strain in the district. Trials of early strains of *kudai* No. 25 and 42 were also conducted with local *kudai* check by Fishers' method. *Kudai* No. 25 is a white grain variety and has given 16.6 per cent. increased yield over the check. This variety is also appreciated in the coastal tract and its village trials will be undertaken in the coming season. *Kudai* No. 42 has also given 10 per cent. more increase over the local check but as it is a red grain variety cultivators do not like the same.

5. Among the intermediate strains *Panwel* No. 61 was found quite suitable and it was tried with local *Waksal* by A.B.B.A. method in 10 replications. It has given 14.7 per cent. increase in grain yield over the local and the increase is quite significant. This strain is highly appreciated in Dapoli, Chiplun and Ratnagiri talukas and its distribution has been already commenced since the last two years. All the available seeds of the *Patani*, *Kudai* and *Panwel* varieties have been supplied to the registered seed growers for propagation.

6. At Sakharpa sub-station, the trials of intermediate and late strains mentioned on page 160 of the last year's report were tried. Among the *Waksal* selections strains Nos. 206, 271, 275 and 290 were found superior, but the best performance was seen in strain No. 207. This strain has given 20 per cent. increased yield over local *waksal* and it will be tried on a field scale next year. Among the *Bhadas* selections strains Nos. 79 and 92 have maintained their superiority over the local *Bhadas*, giving 14.2 and 21.2 per cent. increased yield over the check; both of them will be tried on a field scale. Selection in *Varangal* type has been started during the year under report, and strains No. 420, 448, 447 appear promising and have given increased yield of 26.1, 25.7, 23.7 per cent. respectively over the local *varangal* variety.

7. At the Kumta Farm fortunately, there was very little attack of Kanne pest and hence reliable results have been obtained from some of the promising varieties. Among the early varieties *Jaddu* strain No. 1061 and *Maskati* No. 1315 have given increased yield of 11 and 12 per cent. over the local *Maskati* check and appear to be promising. They were tried in ten replications and the results are significant. In the *Somsal* variety, strain No. 1650 was tried by A.B.B.A. method in six replications, and it has given 32 per cent. increased yield over the local *Somsal* check. This strain will be useful in replacing the local *somsal* variety in Siddapur Taluka. On the Kumta Farm, selection in several other varieties was done during the past years; but it has now been decided to concentrate the attention only on four important strains, viz. *Maskati*, *Halga*, *Somsal* and *Dasar-patta*.

8. At the Kumta Farm manurial experiments on rice were conducted with ammo phos, calcium cyanamide and bone meal with and without farm yard manure. From the observations it may be remarked that ammo-phos with or without F.Y.M. has given higher percentage of tillers than calcium cyanamide, but in the point of height, length and weight of the panicle, calcium cyanamide stands superior to ammo-phos. The effect of bone meal alone is not very marked. In point of yield calcium cyanamide with F.Y.M. has given an increased yield of 42.9 per cent. over the check plot of F.Y.M. Ammo-phos plus F.Y.M. has increased yield by 40.2 per cent. The quantity of manure added was 100 lbs. of ammo phos per acre or 2 cwts. of calcium cyanamide or bone meal per acre with 4,000 lbs. of F.Y.M., as a common dose for all. From these results it will be seen that the acidic soils of Kumta respond fairly well to calcium and this confirms the observations made in the past.

9. The trials of different green manures in combination with bone meal were also tried on the Kumta Farm for the last four years and the results are almost conclusive. From the results it can be seen that a combination of the leaves of *Nuxvomica* and bone meal, has increased the yield by 149·2 per cent. over the check of F.Y.M. While the leaves of *Terminalia Paniculata* and bone meal have increased the yield by 94·1 per cent. The highest yield from the former was 3,029 lbs. of grain and 3,960 lbs. of straw per acre as against 1,457 lbs. of grain and 1,589 lbs. of straw per acre from the plot of F.Y.M. These results have been corroborated for the last three years and it is now high time to demonstrate them in the cultivators' fields.

10. *Rice Research at Karjat*.—As mentioned on page 161 of the last year's report the object of rice research at Karjat is to increase the yield by manurial and cultural methods. With this object in view the following experiments were conducted :—

(1) *To get the highest yield for a given dose of manure by changing the number of seedlings per bunch*.—This experiment has now been in progress for the last three years. From the results it may be remarked (a) that with four seedlings per bunch, each lb. of nitrogen applied to the crop has approximately increased the yield by 1 per cent. This relation however does not hold good with either 8 or 12 seedlings per bunch. (b) The highest net profit came to Rs. 33 per acre with four seedlings and 60 lbs. of nitrogen per acre. Next to that a profit of Rs. 23 per acre was derived from four seedlings and 40 lbs. of nitrogen or 8 seedlings with the same quantity of nitrogen per acre. (c) By increasing the size of the bunch there is a great tendency to produce more vegetative growth at the cost of grain.

(2) Purity of the different generations of the Kolamba strains distributed in the district was tested by analysing several samples received from the district and it is gratifying to note that the percentage of impurity did not exceed more than 3 per cent. from 3rd to 6th generation.

(3) The application of the new manure Nicifos was conducted with sulphate of ammonia and it was found that Nicifos cannot be favourably compared with sulphate of ammonia for rice cultivation on the trap soils.

(4) Trials of sulphate of ammonia on early variety of Kolamba No. 401 have increased the yield from 40 to 50 per cent. over the no-manure plot and the net profit after defraying the cost of manure came to Rs. 13 per acre over the no-manure plot.

(5) An experiment was laid out to see whether continuous application of sulphate of ammonia reduces the lime content of the soil. For this experiment, a special plot is reserved, in which sulphate of ammonia is added at the rate of 300 lbs. per acre. From the results of the analysis of this year, it was found that calcium was reduced by 10 per cent. while organic matter was reduced by 5·8 per cent. These losses seem to be significant and it will have to be made up, in the long run, if sulphate of ammonia is continuously applied.

Effect of the application of sulphate of ammonia in several stages of the plant was watched by special experiment with 60 lbs. of nitrogen per acre. An experiment for finding out the exact time of the application of sulphate of ammonia is in progress for several years past, and it was observed that the rice plant used the manure to a greater advantage if the manure was given in three stages of the plant growth, instead of giving out all at once. From the results it may be remarked that (a) Manuring with 20 lbs. of nitrogen per acre at pre-flowering stage has increased the yield considerably. (b) Unlike last year flowering dose has given less yield than what was expected. (c) When a dose of 40 lbs. of nitrogen per acre is given at tillering and pre-flowering, it gives better yield than the whole manure applied at once. The highest yield is recorded with 60 lbs. of nitrogen given in 3 doses, viz., tillering, pre-flowering and flowering.

(6) *Effect of manure on proteid contents.*—Experiments to determine the proteid contents of the Kolamba strains manured with sulphate of ammonia, are in progress and from the results it may be remarked that the percentage of proteid is decreased by 1 per cent. when a heavy dose of sulphate of ammonia is given to the crop. But as this is the first year of the experiment, it is too early to draw general conclusions.

(2) *Nagli.*

11. The work of propagating promising strains of Nagli and also of confirming the results of the varietal trials mentioned on page 163 of the last year's report was continued at the Hatkhamba sub-station during the year under report. The strains No. A 16, B 11, E 31 and E 82 were tried by the Fishers' method in four replications along with the local *Kalperi* and the results are given below. A 16 has given 37 per cent. increased outturn over the local check and it stands first in point of yield. E 31 has given 25 per cent. increased yield and it stands second in the order of merit. B 11 and E 82 have given 17 and 15 per cent. increased yield and they are suitable for the coastal tract, being very early varieties.

12. The manurial trials mentioned in the last year's report were also conducted on both the varieties of B 11 and E 31 by Fishers' method. In both the cases the mixture of the sulphate of ammonia and bone meal has given the best results with 41 and 62 per cent. increase in yield over the no manure plot and about 20 per cent. increased yield over the fish manure plot. A combination of this manure has now been adopted by several cultivators in the district.

(3) *Sugarcane.*

13. The work mentioned on page 163 of the last year's report, was further continued at the Kumta Farm during this year. In the manurial experiments on sugarcane, undi cake, sulphate of ammonia and bone meal were tried singly and in various combinations. 150 lbs. of nitrogen was added per acre half of which was given in the form of F.Y.M. and

the other half in the form of concentrated manures. From the results it may be remarked, that an addition of 200 lbs. of bone meal in combination of undi cake and sulphate of ammonia, has given the highest yield viz., 13,960 lbs. of liquid gul per acre as against the yield of 7,240 lbs. of liquid gul from the plot of F.Y.M. Undi cake and sulphate of ammonia when applied singly has given 9,120 and 10,600 lbs. of liquid gul per acre. The above results confirm the conclusions of the previous year viz., sulphate of ammonia is not very effective in acidic soils and requires a combination of phosphoric acid. In the coming year Nicifos manure, which contains both nitrogen and phosphoric acid, will be tried on sugarcane.

14. Among the varietal experiments, J. 213, H.M. 87, H.M. 89 and H.M. 544, and Red Mauritius and Manjav were tried. Out of these, H.M. 87 gave the highest yield viz., 18,640 lbs. of liquid gul per acre ; H.M. 544 stood second giving 14,440 lbs. of gul ; J. 213 has given comparatively low yield of 10,360 lbs. of gul but it is very early and suitable for *Maki* (high lying) lands. The Red Mauritius has given the lowest yield viz., 8,960 lbs. of gul.

15. Six new varieties have been received from Coimbatore for a trial on a small scale and they appear to be promising on account of their erect habit and early ripening and better tillering qualities.

16. On the Ratnagiri Farm most of these varieties were tried for supplying sets to cultivators. Out of these C.O. 313, C.O. 312 and C.O. 230 have given the best yields.

(4) *Mango.*

17. This is the sixth year of the Mango Investigation work conducted at the Ratnagiri Farm to find out the causes of the enormous amount of shedding of mango flowers and young fruit. From the investigation it has been found that the mango hoppers and mildew are the two main causes which affect the mango crop almost every year. A large number of spraying and dusting remedies were tried, out of which sulphur alone and sulphur-cyanide dust (6 : 1) have been found to be very effective. During the year under report, both these remedies were tried on an extensive scale, there being 2 blocks of 20 trees each, under different treatments. A similar block of untreated trees was also kept as a check. From the records of cost of treatment and extra fruit obtained, the economic aspect of each treatment has been worked out. Some observations on mildew and the life history and habits of the hoppers were also studied.

18. There were three flushes of flowers—1st in November-December, 2nd in January and 3rd in February. About 2 per cent. of the total flowering took place at the first flush, 51 per cent. in second and 47 per cent. in the third. The second flush was affected somewhat badly by the attack of hoppers and the damage done was 27 per cent. The third flush was affected by the mildew and also by hoppers to a slight extent. The damage done by both the pests came to 21 per cent. in the 3rd flush.

19. Of the three species of hoppers *I. Clypealis* has been found to be the most harmful, due to its enormous number and prolific breeding and migratory habits. The life history of this species has been found as follows :—Egg stage 5 to 6 days ; Nymphal stage 12 to 13 days ; total duration of life cycle 17 to 18 days ; number of molts cast 4. Thus the life history of all the species is the same. *I. Niveosparsus* though breeding throughout the season is not so harmful on account of its smaller number. The hoppers particularly of the species *I. Clypealis* are capable of flying long distances for infesting fresh flowerheads.

20. Open exposed situations are more favourable to the spread of mildew, than the closed ones, the wind being the main agent of dissemination of spores. The period from about the middle of January to the middle of March is more suitable for the development of mildew.

21. The following are the results of the dusting treatments tried during the year :—

Name of treatment	Cost of treatment		Percentage of increase of fruits over control	Net profit	
	Per 1,000 flower-heads	Per tree		Per 1,000 flower-heads	Per tree
	Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.
1 Sulphur 2 to 3 dustings ..	0 10 9	1 5 0	105	4 14 1	9 15 3
2 Sulphur 2 dustings (sulphur-cyanide mixture 1 dusting) ..	1 2 3	2 5 2	115	4 15 2	9 6 10

Sulphur treatment is therefore the best and the cheapest and involves no risk to the operator. It is effective against both the hoppers and the mildew. Flowerheads however badly affected, are freed of all the hopper nymphs within 4 to 6 days from the treatment. The smell of sulphur is deterrant to the adults and there is not much oviposition done by them. Two to 3 thorough dustings have to be given in the season at an interval of about a fortnight. At a cost of a rupee per tree a normal crop of mangoes can be ensured even in the presence of a bad attack of the hoppers and the mildew. The net profit per tree was about Rs. 10. This remedy is getting popular among the mango planters of the Ratnagiri district and they have purchased about 50 dusters for dusting their own trees.

22. *Bearing of mangoes.*—In the last year's report methods of regulating the bearing of mango by pruning and manuring were described. These were tried on a large scale during the year. Pruning is particularly useful for trees which are very irregular in bearing. Six branches were pruned every week from November to middle of February, to determine the best time of pruning. Flowerheads appeared from the pruned branches almost throughout this period. But the best

time of pruning was found to be the end of December and beginning of January. The best method of pruning has been found to be that of leaving the lowest 2 or 3 dormant buds on the October shoots and removing the upper portion. It is these buds that develop into flowerheads and leave the buds on the lower wood unaffected to produce vegetative shoots in next June. The detailed results of pruning are given in the following table :—

Tree No.	Number of shoots pruned	Number of shoots flowering	Percentage of pruned shoots producing flowerheads	Number of flowerheads produced	Number of fruits produced	Fruits per 100 flowerheads
66	222	152	68.47	674	268	42.43
33	107	42	39.25	86	63	73.27

23. *Manuring*.—This is another method of inducing the trees to bear year after year. This has been particularly successful with small sized trees 12 to 15 years of age. These trees were manured with 5 lbs. of sulphate of ammonia, 5 lbs. of bone superphosphate and about 100 lbs. of F.Y.M. in the month of June, after the mango crop was harvested. All the manured trees except 2 have again borne fruit this year. Even the two weak plants have become vigorous and are expected to respond to the treatment next season. The yields of manured trees for the two years are given in the following statement :—

Yields of manured trees for successive years.

Tree No.	Yield in 1930		Yield in 1931	
	Number of flowerheads	Fruits	Number of flowerheads	Fruits
107	819	76	224	64
116	98	30	616	153
130	181	42	330	94
138	365	115	286	109
139	743	90	174	39
144	373	69	276	67

24. The problem of regulating the mango blossom by pruning and manuring is of vital importance to the cultivators of Konkan as it is a money crop of this division. As a matter of fact, this problem should have been studied first and the question of studying the shedding of the mango blossom and the fruit, should have been postponed for some time. Unless the plants are made to bear fruit, the preventive and remedial measures against the insect pests and fungus disease have no bearing on the subject. I therefore strongly recommend that this problem should be taken in hand with the generous help of Sir Sassoon David Trust Fund.

(5) *Crabs.*

25. The work mentioned on page 166 of the last year's report was conducted at the Karjat Research Station during the year. The following fumigants and poisons were tried in the field either singly or in combination to destroy the crabs :—

- (1) Carbon bi-sulphide.
- (2) Copper sulphate.
- (3) Potassium cyanide.
- (4) Seekay soil fumigant.

Twenty-five burrows were tried for each treatment. From the results it will be seen that potassium cyanide in combination with carbon bi-sulphide gives the best results, but the cost of this treatment viz., Rs. 23-10-0 per acre is rather prohibitive. Seekay fumigant alone or in combination with potassium cyanide is not very effective. Carbon bi-sulphide is fairly effective in destroying the crabs the percentage of success being 87·5. The cost of this fumigant does not exceed Rs. 2 per acre and this is quite within the means of ordinary cultivator. This treatment alone will be tried on an extensive scale in the coming season.

26. The method of trapping crabs in earthen pots, was also tried at Karjat with some baits to attract the crabs. This method was not found to be very effective as the catches were very few in number. The following baits however were found attractive to the crabs and they will be repeated in the next season :—

- (1) Fermenting jaggery.
- (2) Country liquor.
- (3) Fermenting rice husk or floor.

(6) *Control of storage pest of paddy.*

27. During the year the storage pest of rice was studied at Karjat as complaints were received that Kolamba No. 79 is badly affected by storage pest. Out of the six Kolamba strains introduced in the district strain No. K. 401 was found to be less affected, the degree of its infestation being 6·6 per cent. All other strains were affected to the extent of 11 to 16 per cent. The insect causing this damage was *Sitotroga Cerealella*.

28. The common receptacles in which the rice is stored are the bamboo kangas which were used for the following remedial measures against the pest :—

- A. Fumigation with mercury.
- B. Carbon bi-sulphide.
- C. Drying in the sun before storage.
- D. Ethyl iodide.
- E. Ethyl formate.
- F. Ethyl acetate.

Out of which Ethyl formate, Ethyl acetate and Ethyl iodide have shown the best results. Drying in the sun, also compares favourably with carbon bi-sulphide.

29. Periodical inspection of a few paddy godowns in the town of Karjat, was kept to note the intensity of infestation. Two samples from each godown were analysed every month, one from the surface and one from a layer below two feet from the surface. In the month of January the infection of the surface was only 0.6 per cent. and that of the lower layer was 2.4 per cent. In the month of February the figures of infestation were 4.3 and 3.91 per cent. : while by the end of April the figures of infestation came to 7.6 and 11.9 per cent. From these observations it is quite clear that storage pest is a serious problem and if any successful remedy is found out at least 10 per cent. damage in paddy can be saved.

II—PROPAGANDA.

30. The principal items of the propaganda of the district staff consisted of the following :—

31. (1) *Introduction of improved and high yielding rice strains.*—The new scheme of introducing the improved strains of rice and the distribution through the registered seed growers mentioned on page 161 of the last year's report has now been well established in this division. The different agencies of seed distribution mentioned on the same page are doing good spread work in making the strains popular. In 1930 about 20,000 lbs. of Kolamba strains No. 42, 79, 184, 226 were given to registered seed growers for an area of 650 acres in Thana and Kolaba districts. In normal year about 13 lakhs of seed would have been produced in this area but on account of unfavourable season and damage caused by the late rains, only $\frac{2}{3}$ of the produce was realised and about $4\frac{1}{2}$ lakhs of the seed sufficient for 15,000 acres was distributed to general cultivators during the year under report. During the year 1931 the following quantities of seed were again supplied to new registered seed growers at half the market rate viz., Re. 1-8-0 per maund of 70 lbs. :—

			lbs.
Kolamba No. 42	..	..	11,180
Kolamba No. 79	..	..	950
Kolamba No. 184	..	..	725
Kolamba No. 226	..	..	3,240
Kolamba No. 401	..	..	500
Kolamba No. 412	..	..	225

The total area of rice under the registered seed growers under these strains will therefore be 550 acres during the year 1931-32 and the number of these seed growers is 75.

32. In the Ratnagiri district about 4,600 lbs. of the strains No. Kudai 25, Kudai 42, Panwel 61, Kolamba 79, was distributed to seed growers

for an area of 60 acres. Out of this Kudai No. 42 was rejected on account of its red kernel and from the remaining strains about 60,000 lbs. of produce was realised; half of which was actually distributed as seed for the general cultivators. The area under these strains will be about 500 acres. In the year 1931 the following quantities of seed are again distributed to the seed growers at half the market rate :—

	lbs.
Panwel No. 61	1,725.
Kudai No. 25	1,300
Kolamba No. 79	600
Kolamba No. 181	250
Kolamba No. 401	100
Patani No. 6	400
Waksal No. 207	140

The area under these strains will therefore be about 75 acres.

33. In the Kanara district the new strain viz. Jaddu No. 1061 was tried in Honavar taluka and has given 18 per cent. increased yield over the local rice. The multiplication of this strain will be commenced from the coming season. The distribution of the mass selected seed of Maskati and Halga varieties was continued and about 11,200 lbs. of Halga and 4,500 lbs. of Maskati seed was distributed during the year.

34. (2) *Introduction of improved Nagli strains.*—As stated on page 168 of the last year's report, the distribution of the four important strains of *Nagli* viz. A16, B11, E31 and E82 was continued during the year. As this crop is generally cultivated by poor cultivators, it is rather difficult to introduce the system of registered seed growers for propagating the same. During the year 1930, 850 lbs. of seed was distributed, but nearly three-fourths of the produce received from the seed was utilised for consumption and only the remaining one-fourth was reserved for seed. During the current year special care has been taken to select only well-to-do cultivators as registered seed growers and the following quantities of seed have been supplied to them :—

	lbs.
A16	100
B11	400
E31	275
E82	75

35. (3) *Manures.*—The work mentioned on page 169 of the last year's report was continued during the year. The utility of sulphate of ammonia as a rab substitute and field manure was further demonstrated in cultivators' fields and as a result 30 tons of sulphate of ammonia was utilised for rab substitute in Thana, Kolaba and Ratnagiri districts, and about 113 tons of sulphate of ammonia was utilised as a field manure for rice, Nagli and sugarcane throughout the Konkan Division. During the year under report several trials of the new manure Nicifcs were arranged in cultivators' fields with the help of the Imperial Chemical Industries Ltd. and they were found to be very advantageous for the laterite and granite soils of Ratnagiri and Kanara. For the rice

crop, 100 lbs. of Nicifos for high land, 150 lbs. of Nicifos for low land, have given the best results and the yield has been increased from 26 to 90 per cent. over the no-manure crop. This manure however has not shown any advantage in the trap soils, when compared with the effect of sulphate of ammonia. The mixture of bone meal and sulphate of ammonia was also utilised by several cultivators for Nagli crop, as the fish manure was costly and not available in sufficient quantities. However on account of the great depression in the price of Nagli it is doubtful how far the cultivation of Nagli will make the two ends meet.

36. During the year the following quantities of artificial manures have been distributed in this division :—

	Tons.
Sulphate of ammonia	143
Bone meal	32
Super phosphate	8
Nicifos	14

37. (4) *Denaturalised salt*.—The supply of denaturalised salt at a concession rate of 8 annas per maund was continued through the Salt Department and licenses for 3,364 maunds of denaturalised salt were issued.

38. (5) *Implements and Machinery*.—During the year 7 Meston ploughs, 37 Bulsar rahats, 26 Nor-cross handhoes, 42 peerless dust guns and 29 sprayers were supplied by the Department. About 29 pumping plants were also erected during the year mostly in the Thana district.

39. (6) *Breeding bulls*.—During the year under report there were five premium bulls in Thana and one bull in Kanara district. The bull at Killar in Kanara district died in the month of September after serving 15 cows. The bulls at Mulund, Dombivali, Maroli, Umbergaon and Saphala have covered 136 cows during the year. The buffaloes at Ratnagiri and Kumta Farms have covered 185 she-buffaloes.

40. (7) *Spraying against Koleroga*.—During the year the work of spraying betelnut against Koleroga disease was further continued in Sirsi, Siddapur, Yellapur, Kumta and Honavar talukas of the Kanara district. Due to general depression in the prices of Supari people were not so keen in adopting this measure but on account of Government help in the form of bonus and spraying materials, about 800 acres under Supari have been sprayed during the year. In all 278 garden cultivators adopted the spraying. There were 50 training classes arranged in different centres and spraying materials worth about Rs. 3,500 were supplied to the cultivators. The trial of power sprayer was conducted in 5 places in the Sirsi taluka but on account of the difficulty of taking the sprayer inside the garden and due to the wastage of the spraying material, this machine could not be economically used. The Agricultural Engineer is being consulted to find out the necessary modifications in this machine. In the Ratnagiri district, the spraying work was conducted with the help of Taluka Development Association, Dapoli, and about 60 acres under Supari have been sprayed against Koleroga.

41. (8) *Dusting of mangoes.*—As mentioned above the dusting of mangoes against the hoppers and mildew with a fine dust of sulphur has been found very effective and people are now quite satisfied with this treatment. Every intelligent mango grower in the Ratnagiri district has now adopted this method and more than 50 dust guns are now working in this division. This work has become one of the routine work now and all the Associations and the district staff were fully engaged in pushing on this work. With the help of the extension of a flexible rubber tube it is now possible to dust a mango plant at a height of 30 to 35 feet by the peerless dust gun. The power dusting machine from America was received very late in the season and hence its trials could not be undertaken.

42. (9) *Grading of mangoes.*—From the experience of the last two years it was thought desirable to introduce grading and scientific packing of mangoes before they are despatched to Bombay. During the year this work was undertaken at Vengurla, Malwan and Ratnagiri and about 2,000 baskets and trunks of mangoes were sent, after grading them in special, first and second grades. Two fieldmen were specially appointed in Vengurla and Malwan to supervise this work and to help the merchants in grading their produce. To facilitate grading, card boards with three holes of $3\frac{3}{16}$ ", $3\frac{1}{16}$ " and $2\frac{13}{16}$ " in diameter representing the sizes of special and first and second grades were supplied to them to sort their mangoes and labels of different colours, showing the quality and guarantee of the fruit were attached to the graded baskets. These labels certified that the fruit was graded by the Agricultural Department and guaranteed the quality of the fruit from top to bottom. At the end of April, the difference between graded and ungraded was very marked, and the graded fruit could fetch Rs. 5-12-0 more per hundred. About the middle of May the extra price realised came to Rs. 2 per hundred and at the end of May when the whole market was glutted with mango there was hardly any difference between the graded and ungraded fruits. Dealers in mangoes have now realised the advantages in grading and it is expected that Mango Sale Societies will be started in all the three centres.

43. (10) *Canning.*—At the end of May the steamer communication with Bombay is generally stopped; and to export the surplus mangoes by rail via Kolhapur is rather costly. In order therefore to utilise the surplus produce, demonstrations of canning mango pulp were given at Malwan, Vengurla and Ratnagiri and the people have now agreed to adopt this method, on a commercial scale. At Ratnagiri nearly 1,100 tins have been canned with mango pulp and they will be sent to Bombay for sale. Canning of mango pulp will serve as a cottage industry when there is no scope of exporting the surplus produce.

Four consignments of 6 dozen best Alphanso mangoes each were supplied to the Horticulturist to Government for despatching the same to England and their result is awaited.

44. (11) *Shows and Demonstrations.*—During the year under report, the grant under Demonstration and Shows was withdrawn and

consequently big shows could not be arranged ; at Dombivali, however, a Thana District Cattle Show was arranged with the help of Dombivali Go Shala which was attended by 8 to 10 thousand people. During the year 440 demonstration plots were arranged in this Division. 119 small and 11 big demonstrations were also arranged mostly with the help of Taluka Development Associations. The magic lantern lectures were also arranged as usual.

45. (12) *Introduction of new crops.*—Uptil now the tobacco crop was taken in Konkan in the Rabi season with irrigation facilities and consequently the scope of developing this cultivation is very very limited. During the year under report an experiment to cultivate this crop, in the semi-kharif season on varkas land, was conducted in Kolaba, Ratnagiri and Kanara districts. As varkas land is poor in fertility, green manuring with san or Cowpea (*Chavali*) was arranged in the beginning of monsoon and the transplanting of tobacco was done in August. As the crop received sufficient rain till the end of October there was no necessity to irrigate this crop. The variety selected was Nadiad No. 28 and Nipani local. The former appears to be quite suitable for the tract although the finished product was not sufficiently strong when compared with that of Nipani or Gujerat. The yield varied from 400 to 800 lbs. per acre which is fairly remunerating. If proper curing process be introduced there is good scope for developing this crop as very large area under varkas crop is kept fallow for years together.

46. (13) *Demonstration of siloes.*—During the year under report demonstration of silage in 4 *kachha* pits was made at Umbergaon, Palghar, Chiplun and Killar from the allotment of Rs. 300 made from Sir Sassoon David Trust Fund. All the demonstrations were quite successful and were attended by several cultivators. The silage was excellent in quality and was eaten by cattle with great relish. Many well-to-do people have agreed to follow this process in the coming season.

47. (14) *Sugar making in Kanara.*—In Kanara district the area under sugarcane varies from 3,000 to 3,500 acres and there is a practice of preparing liquid gul in major portion of the district. This liquid gul is similar to rab (cyrup) prepared for manufacturing sugar. But it contains good many impurities as no attempt is generally made to remove the scum. With the object of ascertaining whether the liquid gul can be converted into sugar by the Hadi's process, an experiment was conducted at Killar of the Siddapur taluka in the field of Mr. G. R. Hegde. He has purchased the power crusher and the Centrifugal machine but for want of the requisite technical knowledge he was unable to manufacture sugar. During the year under report the necessary apparatus required for this process and the help of a trained agricultural graduate was given to him. The juice was boiled in the improved set of pans on a specially constructed multiple furnace according to the U. P. method. The clarifying agents utilised were the Mucilagerous decoction of Bhendi leaves and the bark of *Bombax malabaricum*. The solution of "Seegi khar" was also added to remove the impurity.

Different qualities of rab were produced at a temperature varying from 100° to 115° C. After allowing the rab to settle in the tins for 4 to 8 days it was passed into the Centrifugal machine by adding a tea-spoonful of Hydros—the bleaching agent. The percentage of the first sugar came to 44 and the product was fairly crystalline and white in colour. The percentage of the second sugar varied from 35 to 40 and the molasses were again mixed with liquid sugar and sold in the market. The owner was thoroughly satisfied as this was the first experiment of its kind in Kanara. He was able to dispose off this sugar at Rs. 4-8-0 to Rs. 5 per maund, when the price of liquid gul was Rs. 2-8-0 and Rs. 3 per maund. The scope of such enterprise as a village industry is fairly large in Kanara and the effect of this demonstration will be seen in the next year.

48. (15) *Publications*.—During the year 73 articles on agricultural subjects were contributed to the *Agricultural College Magazine*, *Sketki and Shetkari* and the *Kanarese Okkaligaroo and Okkalatanoo and the Agriculture and Livestock in India*. The bulletin of sugarcane cultivation in Kanara is being drafted.

The following leaflets were published during the year :—

1. Economy of rice seed and the proper method of raising rice seedlings in Kanara.
2. Economic manures for garden crops in the North Konkan.
3. Mango hoppers and mildew and their control.
4. Rabi cultivation of chillies in the North Konkan.

Besides these, the Taluka Development Associations have published several leaflets dealing with important agricultural subjects pertaining to their tracts.

Besides the Ratnagiri Correspondent of the *Times of India* used to take notes on agricultural topic every now and then and more than 60 notes have been supplied to him which were published in the issues of the *Times of India* from time to time.

III. AGRICULTURAL ORGANISATION.

49. (1) *Divisional Board of Agriculture*.—During the year under report there were four quarterly meetings of the Konkan Divisional Board held in October, December, April and June. The first meeting was presided by the Deputy Director of Agriculture, Konkan Division, and the remaining 3 meetings by the Assistant Registrar, Co-operative Societies, Belgaum.

A special conference of all the Taluka Development Associations was arranged on 22nd February 1931 in Bombay and it was presided by the Honourable Diwan Bahadur S. T. Kambli, Minister of Agriculture. It was represented by 75 delegates from all Taluka Development Associations in Konkan and a thorough discussion about the past and future work of these Associations was made. Resolutions passed in this Conference have been already supplied to several officers.

50. (2) *Taluka Development Associations.*—During the year under report there was no change in the number of Taluka Development Associations as these could not be increased for want of funds. There are in all 11 registered Taluka Development Associations and two unregistered Associations in this division. Most of them have put in fairly good work during the year. The work of the Sirsi, Dapoli, Palghar and Dahanu Associations deserve special mention, as they have made the agricultural improvement more popular in those talukas. The Sirsi Taluka Development Association has rendered substantial help in spraying work against Koleroga. Dapoli Association has arranged several demonstration plots and has raised the public enthusiasm by holding good many demonstrations. Palghar and Dahanu Associations have rendered material help in the introduction of improved seeds and also by arranging big demonstrations in several places. They have also published important leaflets giving timely hints and full description about the cultivation and manuring of the crops.

Only two Associations at Kalyan and Ratnagiri are below the mark and they have been warned to improve their work.

IV. AGRICULTURAL SERVICE.

51. The Boring Section was discontinued by Government from 1st November 1930. During the period Mr G. S. Joshi was in charge of the Boring work. There were 7 power boring machines including the Calyx in this division. Besides these, 2 hand machines lent by the Agricultural Engineer were working.

52. The total number of bores undertaken was 16 in four months as against 84 of the previous year. Out of these 16 bores, 13 were successful, 2 unsuccessful and 1 abandoned owing to technical difficulties. The total footage of bore was 1,482'-4" for 4 months, as against 5,860'-9" of the previous year. This progress is considered as very satisfactory as the work was done during the four months of rainy season. The statement of detailed information regarding the boring work prescribed in Government Resolution 7075, Revenue Department, dated 5th May 1923, is appended herewith.

V. AGRICULTURAL EDUCATION.

53. *Jambul Agricultural School.*—This is the fourteenth year of the Jambul Agricultural School started with the donation of the Late Rao Saheb Pisal. During the year under report there were 30 students in the school, 20 in the first year and 10 in the second year. As the school was to be discontinued from 1st April 1931, the annual examination was held on the 10th March 1931 by the Inspector of Agricultural Schools and the Head Master, and the results were as under :—

In the second year all the 10 students have passed the examination and in the first year only 15 students appeared for the examination out

of which 13 have come out successful. The remarks of the Examiners are given below :—

“On the whole the result has been satisfactory and the staff have shown improvement in their work. The first year boys however have not done well in Nature Study.”

54. The Rajapur Shikshan Parasarak Mandal has also opened an Agricultural School in which 14 students were admitted. They were also examined by the Inspector of Agricultural Schools and 12 students have passed with credit.

Personal.

55. During the year under report almost all the staff including my office have put in fairly good work. The district staff had to face several difficulties on account of the general agitation of the public but it is gratifying to note that the work of this division has not suffered to any extent. During the year, the work done by Mr. K. B. Modi, District Agricultural Overseer, Palghar, deserves special mention on account of his good organising capacity of taluka meetings and demonstrations. Mr P. V. Wagle has also shown special aptitude for research work and has found out effective remedy against the mango heppers and mildew.

V. V. GADGIL,

Deputy Director of Agriculture,
Konkan Division.

Ratnagiri, 10th July 1931.

Annual Report of Boring work done during the year 1930-31

Serial No.	Name of well owner	Survey No.	Name of taluka	Name of village	Surface bore or well bore with dimensions of the bore	Diameter of the bore
	2	3	4	5	6	7
	<i>Machine No. 2 Calyx Drill</i>					
1	Hansraj Premji Sroff		Salsette	Vile Parle	Surface	5"
2	Laxmidas Govardhandas		Do.	Do.	Do.	5"
	<i>Machine No. 16</i>					
3	Dhanjisha L. Sidhava		Dahanu	Ghotwad	Do.	4"
4	Do.		Do.	Do.	Do.	4"
	<i>Machine No. 46</i>					
5	Devji Mohamad Khoja		Palghar	Palghar	Do.	5"
	<i>Machine No. 16</i>					
6	President, Thana Municipality.		Thana	Navapada	Well	4"
7	Do.		Do.	Tembhi Naka	Surface	4"
8	Do.		Salsette	Uthalsai	Do.	4"
	<i>Machine No. 5</i>					
9	Tribhuvandas Jamnadas		Thana	Thana	Well	3 1/4"
10	N. L. Nakhava		Salsette	Navapada	Do.	3 1/4"
	<i>Machine No. 14</i>					
11	Kalidas Khushaldas		Palghar	Boisar	Surface	3"
12	K. N. Marzaban		Do.	Do.	Do.	4"
	<i>Machine No. 6</i>					
13	V. L. Tilak		Pen	Wavoshi	Do.	4"
14	Do.		Do.	Do.	Do.	4"
15	Do.		Do.	Do.	Do.	4"
	<i>Machine No. 21</i>					
16	N. S. Herlekar		Karwar	Sirwad	Do.	4"

ending 31st October 1930 in the Konkan Division.

Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	No. of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating oil, coal, carting, cutting, shoes, etc.	Departmental charges for the well owner	Average Departmental expenses on the boring including Supervision and depression charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
200'	..	250	250	199 8 0	291 8 5	306 14 0	561 7 4
68'	..	250	250	89 0 0	128 4 0	85 2 0	190 14 4
110'	..	110	110	33 0 0	64 9 0	143 0 0	308 12 10
200'	..	200	200	98 0 0	92 4 4	275 0 0	561 7 4
61'	..	Incomplete.		44 0 0		Incomplete.	
177'	..	Trial not taken.		108 6 0	78 12 6	162 8 0	496 14 3
70'	..	200	200	45 0 0	139 8 0	80 4 3	196 8 2
125'	..	240	240	94 14 0	195 7 6	102 8 0	350 14 7
78'	..	200	200	343 4 0	74 0 0	99 3 0	213 5 8
50'	..	200	200	154 0 0	77 8 0	50 0 0	140 5 10
50'	..	600	600	58 0 0	30 8 0	50 0 0	140 5 10
46'	..	Accident in a bore.		121 8 0	47 14 0	Bill not preferred.	130 2 2
69'	..	Trial not taken.		32 0 0	45 4 0	80 0 0	393 11 3
21'	..	Do.		34 12 0	30 2 0	.....	58 15 3
76'	..	300	300	31 12 0	60 8 0	87 8 0	210 8 9
84-4'	..	240	240	107 4 6	24 0 0	101 9 0	236 11 11

Annual Report of Boring work done during the year 1930-31

Serial No.	Name of well owner	Survey No.	Name of taluka	Name of village	Surface bore or well bore with dimensions of the bore	Average Departmental expenses on the boring including running expenses, mechanics, wages and repair
1	2	3	4	5	6	16
	<i>Machine No. 2 Calys Drill</i>					Rs. a. p.
1	Hanaraj Premji Sroff	..	Salsette	Vile Parle	Surface	95 12 0
2	Laxmidas Govardhandas.	..	Do.	Do.	Do.	29 2 9
	<i>Machine No. 16</i>					
3	Dhanjisha L. Sidhava	..	Dahanu	Gholwad	Surface	45 4 0
4	Do.	..	Do.	Do.	Do.	145 4 0
	<i>Machine No. 46</i>					
5	Devji Mohamad Khoja	..	Palghar	Palghar	Surface	Incomplete
	<i>Machine No. 16</i>					
6	President, Thana Municipality.	..	Thana	Navapada	Well	125 15 0
7	Do.	..	Do.	Tembhi Naka	Surface	79 15 0
8	Do.	..	Salsette	Uthalsai	Do.	134 10 0
	<i>Machine No. 6</i>					
9	Tribhuvandas Jannadas	..	Thana	Thana	Well	54 0 0
10	N. L. Nakhava	..	Salsette	Navapada	Do.	32 0 0
	<i>Machine No. 14</i>					
11	Kalidas Khushaldas	..	Palghar	Bokar	Surface	25 0 0
12	K. N. Marzaban	..	Do.	Do.	Do.	39 6 0
	<i>Machine No. 6</i>					
13	V. L. Tilak	..	Pen	Wawoshi	Surface	84 5 0
14	Do.	..	Do.	Do.	Do.	69 0 0
15	Do.	..	Do.	Do.	Do.	90 5 0
	<i>Machine No. 21</i>					
16	N. S. Harlekar	..	Karwar	Sirwad	Surface	79 15 0

ending 31st October 1930 in the Konkan Division—contd.

Cost of bore to the well owner	Total cost of the bore inclusive of well owner's and Departmental cost	Cost per foot for the well owner	Total cost per foot	Object of boring i.e., agriculture or drinking	Remarks
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
797 14 5	1,455 1 9	4 0 0	7 5 10	Drinking ..	Successful.
302 6 0	522 6 4	4 7 0	7 10 11	Do. ..	Do.
241 9 0	595 9 10	2 3 0	5 6 8	Agriculture ..	Water taste not taken.
465 4 4	1,171 15 8	2 6 0	5 13 9	Do. ..	Successful.
Incomplete					Unsuccessful.
349 10 6	982 7 9	2 0 0	5 8 10	Agriculture ..	Successful.
284 12 3	541 3 5	1 4 0	7 11 8	Drinking ..	Do.
451 12 6	937 6 1	1 14 0	7 8 0	Do. ..	Do.
521 2 0	790 12 8	6 8 0	10 6 6	Do. ..	Do.
231 8 0	453 13 10	5 8 0	9 1 3	Agriculture and drinking ..	Do.
105 8 0	270 12 10	2 1 0	5 6 8	Drinking ..	Do.
Accident in the bore.				Agriculture ..	Unsuccessful.
157 4 0	635 4 3	2 4 5	9 3 4	Drinking ..	Successful.
73 14 0	201 13 3	3 8 3	9 9 9	Do. ..	Unsuccessful. Abandoned owing to technical difficulties.
188 12 0	489 9 9	2 8 3	6 8 5	Do. ..	Successful.
232 4 6	548 15 5	2 12 0	6 8 2	Do. ..	Do.

APPENDIX H.

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF AGRICULTURE,
POONA, FOR THE YEAR 1930-31.

Charge.—Mr. V. G. Gokhale continued to be in charge of the office of the Professor of Agriculture throughout the year.

2. *Lines of work.*—The lines of work, as before, may be put into four sections viz :—

(A) *Teaching.*—This is the primary work of this section. It comprises the subject of Agriculture including Animal Husbandry and Dairying, taught as laid down by the Bombay University for the degree of Bachelor of Agriculture, and amounts to about 46 per cent. of the total teaching work of this College. Two of the Department's largest institutions namely the College Farm and the College Dairy are required to be run mainly for the purposes of practical instruction in this subject.

This section has also to conduct the instruction in the above mentioned subjects to the Short-Course Class—a special one year's course for practical men, occupying about 70 per cent. of their total teaching at this College.

In addition to these two regular courses, special courses are also offered particularly in practical affairs of farm and animal management.

(B) *Research and Investigations.*—Whatever odd and suitable time is available after meeting the primary needs under teaching, is utilised by every member of the staff to work out such items of Research as are possible.

(C) *The Commercial working of the Dairy.*—Besides serving as a unit for practical instruction of students, the College Dairy is run on a commercial basis.

(D) *Aid and Assistance to the Public.*—This part of the work consists in helping the public with information on a variety of agricultural matters such as cultivation of crops, manures and manuring, implements, seeds etc.

3. *Staff.*—The strength of the staff began with 12, 11 for teaching and 1 for special fertilisers experiments, and remained the same until the beginning of January from which time one post has been ordered to be kept vacant as a measure of retrenchment. The staff at the end of the year of report was thus as under :—

- 1 Professor of Agriculture, in the Indian Agricultural Service.
- 1 Assistant Professor of Agriculture, in the Bombay Agricultural Service.
- 1 Assistant Professor of Dairying and Animal Husbandry, in the Bombay Agricultural Service.
- 1 Lecturer in Agriculture.
- 1 Lecturer in Dairying.
- 4 Demonstrators in Agriculture.
- 1 Demonstrator in Dairying.
- 1 Graduate Assistant for Fertiliser Research.

A.—Teaching.

4. *The Graduate Course.*—In all 71 students appeared for the degree examination out of which 80 per cent., as against 82 per cent. of the last year, have passed in Agriculture. There has been no marked change in the general calibre.

In the Intermediate Agricultural Examination, out of 86 that appeared, 87 per cent. passed in Agriculture as against no failure during the last year. The need of increasing the standard of passing in Agriculture from 33 to 40 per cent. in order to improve the general standard of the College seems desirable.

Even during this year, no additional assistance could be available to make any progress in solving the difficulty of the absence of text books in the subject of Agriculture.

There were in all 14 students that took Intensive Study of Crops for the optional subject, 5 taking Dry Crops including a detailed study of Cotton, 7 taking Irrigation Crops including sugarcane and its alternative and market gardening, and 2 taking Rice and the alternative and additional crops grown in the rice regions. Only 13 appeared for their examination. Percentage of passing was 77 against 73 during the last year.

The suggestion made for some time now, that guaranteeing a post in the higher ranks of service to the first class first man each year would almost at once improve the recruitment at the College, needs be emphasized again. The earlier this suggestion is considered favourably the better would it be both for the interest of the Agricultural education and also the Department.

5. *The M.Ag. Course.*—One student was taken up for a thesis on sugarcane tillering, but he has not continued the studies during this year.

6. *The one year's general Short-Course.*—There were in all 12 students to begin with. Out of this 10 completed their course and appeared for their examination and 8 passed in their subject of Agriculture. The general calibre was only fair.

Special Courses.—Those given during the year were as shown below :—

	No. of Students	Duration of the course
(1) Post-Graduate Training in Dairying	2	90 days.
(2) General study of implements, manures and crop growing.	9*	2 "

*Irrigation Department Officers.

7. *The College Farm*.—This farm is maintained mainly to afford all possible facilities for the teaching of practical agriculture. Consistently with the main purpose, it also provides land and facilities for carrying out Researches involving field experiments to the several sections of the College. A representative collection of indigenous as well as improved implements is specially maintained for the benefit of the students as also the visitors. A small workshop is run mainly to help in the teaching of carpentry and smithy to the first year students by the Engineering section and secondly to effect necessary repairs to the farm-owned implements as also of the public whenever possible.

An interesting museum of all possible growing crops of the Bombay Presidency is specially maintained in both the *kharif* and *rabi* seasons and this has been of great help to the students both of this and the other institutions.

The area of the farm remained the same as in the last year, viz. about 275 acres of which about 125 acres were under cultivation, about 50 acres under grazing and the remaining either under building, recreation grounds of students, roads, wells, waste land or *nalas*.

The total rainfall from 1st of May 1930 to 30th April 1931 was 29·6" as against 18·92" of the previous year and an average of 27". Rains started by about the second week of June but useful rains were received by the end of June and the beginning of July on which all *kharif* sowing could be completed, and normal germination was secured except for *bajri* and *jowar* which gave defective germination due to land not settling well at the time of sowing owing to insufficiency of rain for this purpose. August was practically dry with only 1·1" of rainfall. Early groundnut and *nilou jowar* showed signs of shortage of water to some extent. A heavy fall of 2·8" on the 3rd and 4th of September relieved the situation. The rainfall of 8·8" in the first fortnight of September followed by about 7" to the end of October proved very heavy and brought about water logging condition in many places, crops like ginger and tomato, *gawar*, cucurbits, *bajri*, cotton, groundnut, niger seed, etc. which were in flowering and fruiting stages suffering badly. This rainfall of September and October, however, gave a fine start to the *rabi* crops. There was 1·6" of rain in November which further benefited the *rabi* crops. On the whole the season was rather too wet at harvest time for *kharif* crops.

The winter, this year, was on the whole warmer than last year; the minimum temperature went below 45° F. only on two days in the first week of January but on an average it ranged from 50° F. to 55° F.

There was severe attack of rust on wheat, aphid on cabbage, mosaic on double beans, fusarium on potatoes, root borer on sweet potatoes, which did more or less damage to these crops. Attempts to combat these pests and diseases wherever known were done with little success.

The effect of this year's season may be seen from the following statement :—

Crop	Average yield per acre, 1930-31	Average yield per acre, 1929-30	Best yield in the history of the farm	
			Per acre	Year
	Lbs.	Lbs.	Lbs.	
<i>Kharif season—</i>				
Bajri	1,008	941	1,632	1921-22
Late G. Nut (Big Japan)	1,756	2,284*	2,768	1913-14
Cotton (N.R.)	470	995	1,900	1919-20
Fodder jowar	6,752	5,900	12,738	1928-29
Tobacco	1,152	936	1,599	1928-29
<i>Rabi season—</i>				
Shalu jowar, dry	1,208	1,600	2,578	1928-29
Wheat (Baxi), dry	396	600	1,068	1928-29

Outstanding features of this year's cultivation.—As regards yields, the most satisfactory crops were onions for bulbs (20,224 lbs. as against 9,962 last year), garlic (4,302 lbs. as against 3,034 lbs. last year), cucurbits in the monsoon—pumpkin and bottle gourds—(19,480 lbs. and 25,000 lbs. each as against 14,080 and 10,720 lbs. last year), sweet potatoes (13,552 lbs. as against 5,560 lbs. last year), and yams (11,436 as against 5,404 lbs. of last year). *Suran* (Elephant Foot) though started well, suffered in some plots a serious check due to heavy rains and water logging, thus averaging 12.5 tons per acre against 17.6 of last year.

The betle leaf crop yielded only 63 *kudians* as against 121 last year owing to heavy rains in September-October as also to the advanced age of the plantation. Cabbage has been again very unsatisfactory owing particularly to the persistent attack by aphides which have so far withstood all known treatment. These results indicate strongly two important points :—

- (1) The seasonal conditions vary year after year so much as to cause even cent. per cent. and more variations in yields ;
- (2) The need for combating simple looking pests like aphides, jassides and thrips is vitally urgent.

The noteworthy results of some simple experiments given to students for practice will be noted under the section Investigation and Research.

8. *The College Dairy.*—The continued financial stringency has caused the most urgent need of some important breeds of cattle and further modernizing this institution from a teaching point of view, to remain, yet unsatisfied.

* With one irrigation.

B.—Research and Investigation.

9. As mentioned above, small items of Research were undertaken by the staff of this Section according to any small amount of time that could be made available, a full-time Assistant being available only in connection with Research into the value of nitrogenous artificial fertilisers, financed from the Sir Sassoon David Trust Fund. The results are summarised below.

10. *The accurate preliminary testing of the value of certain nitrogenous artificial fertilisers.*—This is the third year of this investigation. The quantities of fertilisers were based as in the last year, on the supply per acre of 10 lbs. of nitrogen in the case of *bajri* and *shalu jowar* and 20 lbs. of nitrogen in the case of groundnut, chillies and onion crops. As regards the kinds of fertilisers, "Leunophos" and "Nitrophoska", used last year, were replaced by Nicifos and a complete fertiliser respectively having each a composition similar to those which they replaced.

The results show significant increases in the case of (1) chillies with all the fertilisers, varying from 45 to 81 per cent. on an average, (2) *bajri* with nitrate of soda 12 per cent., and (3) groundnut with nitrate of soda and Nicifos about 30 and 16 per cent. respectively. *Shalu jowar* and onion have not favourably responded to any of the treatments. The increases are also economical in the case of all the fertilisers for chillies, but not for *bajri* and groundnut.

Last year only chillies showed a significant and economical increase, while with all the remaining crops none of the fertilisers gave statistically significant advantages.

11. *Effect of artificial manure with and without organic matter.*—This is the continuation of the last year's experiment (*vide* page 210) in which the quantities of sulphate of ammonia and farm yard manure are 50 lbs. and $2\frac{1}{2}$ cart-loads per acre respectively. This year's crop was dry wheat as against cotton of last year.

The mean results of different treatments vary from a decrease to an increase of 2 per cent. in comparison with no manure and though these are not statistically significant, the general tendency appears to be that the action of sulphate of ammonia in combination with humus in form of farm yard manure is better than the sum of those of the two stuffs tested singly. Last year with cotton, increases were generally much higher than this year and sulphate of ammonia in association with humus was just about equal to the sum of the two tested singly.

12. *Effect of close contact of fertiliser with seed on its germination power.*—The fertiliser used was sulphate of ammonia at the rate of 20 lbs. of nitrogen per acre. The seeds experimented with were *bajri*, *shalu jowar* and cotton. The results indicate that—

(a) Seeds coming in direct contact with sulphate of ammonia gave a germination of only 10 per cent. when dibbled in pinches mixed with the fertiliser. The damaging effect is not more than 50 per cent. in the case of the mixture being drilled.

(b) In the methods of application of the fertilisers in which the contact between the two is not direct and close, normal germination is not affected.

(c) Cotton-seeds showed the largest effect, next came *shalu jowar* and *bajri*.

(d) On exploring the causes of the above results, it was found that :—

(1) it is the admixture of the soil intervening between the germinating seed and the fertiliser, obtained in drilling the mixture or other methods of distribution, that prevents the germ from being destroyed by the fertiliser ;

(2) washing, with water, the seeds kept mixed with the fertiliser in dry condition of both for 5 minutes, 24 hours and 48 hours, has given normal germination, proving that, in a dry state, no harm is done by the fertiliser to the seed germ in the mixture, up to a period of 48 hours.

13. *Influence of weight of seed on the yield of cotton.*—This is a continuation of the experiment noted in paragraph 10 (page 211) of the Annual Report of 1929-30. Pure F 1 generation seed from selfed plants of Banilla obtained from the Cotton Breeder, Dhulia, was used this year as against mass and selfed seed of last year. One more grade of seed that sank under ordinary water was added to those mentioned last year. From among the light grades, (a) red coated and (b) black coated were sown separately.

The results show that in point of germination all the grades except the red light gave from 80 to 86 per cent. success while the red light gave only 6.7 per cent. germination. The growth as measured in height of plants in the third week of October showed that light seeds gave about 3-4 inches or about 6 per cent. less height than the others which were practically equal.

The yields calculated on the *per plant* basis give no significant difference between the various grades, whereas last year the light seed was significantly inferior to the other grades in the mass seed only. Calculated on *per acre* basis, light seed has given about 70 per cent. less yield than the others merely on account of a corresponding decrease in the number of plants per acre.

14. *Vegetable work.*—At the Crop Research Committee meeting in 1929 it was decided that more intensive and systematic work should be done on vegetables. This section was allotted the work of conducting investigations into the agronomical part of the subject. Previous to this year, however, this section had already in hand certain items of work which have now been fitted into the new scheme. The main directions of the work are indicated by the various headings summarised below :—

(A) *Planning the cropping scheme.*—A scheme for trying alternative cropping systems with a view to get the largest net profit is yet under discussion and will be taken up when finally settled.

(B) *Perfecting the technique of cultivation to get the maximum yields of the best quality of produce.*—The various methods of achieving this are noted below along with a summary of results :—

(a) *Manuring.*—These experiments have been taken up with *suran* and ginger to compare the effect of artificial manures with 800 lbs. groundnut cake, both given in addition to 20 cart-loads of farm yard manure. The artificial manures consisted of sulphate of ammonia, sulphate of potash and superphosphate in such quantities as to give 115 lbs. of nitrogen, 170 lbs. of potash and 84 lbs. phosphoric acid, i.e. in the same proportions as are contained in the respective average crops per acre. Nitrogen in the form of sulphate of ammonia was also tested separately.

(1) *Suran.*—The results with this crop, in 6 replications of one *guntha* each, giving on an average a 16-ton yield per acre do not show any significant differences between the different manures.

(2) *Ginger.*—Here also the plots were of one *guntha* each repeated six times. The crop yields from different manures ranged about 7,000 lbs. to 8,000 lbs. per acre, but the differences are not significant.

(b) *Irrigation.*—Broad ridge method was compared with the flat bed method for root crops under Poona conditions.

(1) *Ginger.*—This is the second year of the experiment. The soil this year was medium black. The results are that the bed method gave only 976 lbs. per acre as against 2,304 lbs. on broad ridges, confirming the last year's results.

(2) *Suran* (Elephant Foot).—This is also the second year of the experiment with the results that the bed method yielded only 3,920 lbs. per acre as against 38,028 lbs. on the broad ridges. The bed method crop failed almost wholly due to extremely poor germination as a result of heavy water logging soon after planting. Last year the bed method was not so inferior, as water logging conditions obtained later when much of the germination had taken place.

(c) *Cultural—Kharif Potatoes.*—This is the second year of this experiment. The results are that the bed method yielded 3,708 lbs. per acre as against 5,384 lbs. of the broad ridges. This confirms last year's results.

(d) *Seeds and Seedlings.*—

(1) *Relation of vigor of chillies seedlings to their final yield.*—This is the third year of the experiment (*vide* page 211 Annual Report for 1929-30). The results indicate that the seedlings raised on raised seed beds with complete manure composed of 1.25 lbs. of sulphate of ammonia, 5 lbs. sulphate of potash and 6 lbs. of superphosphate per 100 square feet of bed area were the best of all as seen particularly from their average height, maximum root penetration and their weight. This added vigor did not however, result into an increased yield. This is in corroboration of the last year's result.

(2) *Mother sets vs. finger sets of turmeric.*—This is the second year of this experiment, to verify the Satara cultivators' belief that mother sets give better yields. The germination noted in the mother sets averaged 36 per cent, less than that of finger sets; the differences in the final yield were not significant however.

(C) *Business management so as to get the best return from garden holding including catering to the market needs.*—This part of the work consisted in trying the cultivation of certain vegetables every month to find out how they would yield and what profits they would bring at different times. The Poona market was taken for this purpose and the following crops were taken up for trial: (1) *gowar* (cluster beans), (2) *bhendi* (Lady's fingers), (3) French beans, (4) peas, (5) tomatoes, (6) brinjals, (7) chillies for spicing, (8) chillies (Dharwar) for vegetable purposes, (9) cabbage and (10) *khira* (white small cucumber). As a result of the last two years' trials, the following general conclusions could be drawn:—

(1) Crops did not do well when grown out of the seasons in which they are commonly grown.

(2) The higher prices realised out of season are not enough to offset the very low yields obtained out of season. Attempts are also being made to determine the optimum conditions of temperature and humidity for the successful growth of the different crops.

(D) *Varieties.*—A comparison of the Poona local red variety of sweet potatoes and the white bunch one from Ratnagiri was taken up since the year under report. Both were grown on the sides of narrow and on broad ridges.

The white bunch variety from Ratnagiri giving a yield of over 16,000 lbs. per acre was nearly twice that of the local red. The tubers of the former are also set much nearer the surface of the ground than in the local red.

15. *Study of farm business under dry farming conditions round Poona.*—With a view to make an intensive study of the farming business near Poona under dry conditions, a compact holding of about 35 acres cultivated by one family has been selected in the village of Bhamburda, since the last two years. This unit has soils of varying types, quite representative of the qualities and proportions of the transitionary belt of the Deccan trap area.

16. *Storage of Kadabi (Dry Jowar fodder).*—On page 213 of the annual report for 1929-30 in paragraph 14 (B) an experiment to ascertain the loss in weight and shrinkage in height in stacks has been referred to. The results obtained during the year show that the loss in weight is from 17 to 24 per cent. and the shrinkage from an original height of 14 feet is from 13 to 19 per cent. in a period of 3 to 12 months.

17. *Comparison of a cement coated silo pit with katcha pit in the Deccan.*—A systematic comparison of the quantity and quality of silage obtainable was made during the year by filling simultaneously the two kinds of silos, eight feet deep and having nearly the same capacities side by side. The filling lasted over 11 days and the taking out of silage,

which commenced six months afterwards, lasted over 34 days. The non-edible silage amounted to .4 per cent. in the cement coated, and .7 in the *katcha* pit silo, of the total good edible quantity taken out, which amounted to 83.1 and 77.2 of the original green maize put in respectively. It is however to be noticed that the less recovery in the *katcha* pit is merely due to more absorption of water by its sides as the percentage of dry matter recovered in each case is the same. The cement coated silo of the above capacity has cost Rs. 525 as against Rs. 84 for the *katcha* pit of the same capacity, from which it is to be concluded that the *katcha* pit is a more economical silo pit under Deccan conditions.

18. *Developing of higher milk yield in cows and buffaloes along with early maturity and regularity of calving, by breeding.*—After a review of the position which had been reached, a systematic policy of further action was laid out in the year 1929 for further improvement of Sindi cows and Surti buffaloes by in-breeding, line-breeding, out crossing and grading. There is nothing specially worthy of note during the year's working.

19. *Value of different roughages—green as well as dry—for Dairy animals in the Deccan.*—During the year under report, the test of green oats and maize silage was repeated with six animals in each group and a total period of 28 days in two intervals. The results show that—

(1) The cows have eaten 25 per cent. more of dry matter in the form of green oat fodder than that of maize silage.

(2) The increased consumption of dry matter in oats has not significantly increased the milk flow.

(3) There is a pronounced increase in the fat content of milk fed on maize silage amounting to 8.5 per cent. more than when fed on oat fodder.

(4) The live weights of the cows on both kinds of fodders remained almost steady.

20. *Requirement of concentrates for Dairy animals under Deccan conditions.*—The effect of *kulthi* and *tur chuni* on milk flow of buffaloes was compared on two groups of 6 animals each over a period of 28 days in 2 intervals. The results show that—

(1) crushed *kulthi* yielded more milk on an average per head per day by 1.25 per cent. than an equal quantity of *tur chuni*. The price of *kulthi* being less than that of *tur chuni*, the former proved to be more profitable;

(2) the fat content and the live weight remained practically unaffected by either treatment;

(3) no ill effects were observed on animals' health by feeding *kulthi*.

21. *Devising and Trial of New Implements.*—The Agricultural side of the trials of the following implements was dealt with by this section:—

Mr. Tagare's hoe.—This is similar to the Deccan blade hoe with the exception that the working edge of the blade has notches like the knife of a mower. No particular difference in the quality of and the power for work was seen when compared with the ordinary blade hoe.

Burn & Co.'s light double mould board plow.—This is similar to a light ridging plow with two mould boards, one on either side. The depth of

penetration in unplowed medium black soil varied from 0·8 to 2·9 inches according to the moisture content of the soil.

Krupp Reaper for Jowar Crop.—This was tried for cutting *shalu Jowar*. The length of the cutting bar is five feet and can cut 3 lines of the crop sown 18 inches apart. About three acres can be cut in a day of eight hours requiring a team weighing not less than 2,400 lbs. The tying of bundles of the reaper-cut crop requires one man-day unit more than that for the hand cut crop. Calculating the working costs together with interest and depreciation and wages at 12 annas per day of man and bullock, the cost of harvesting (including bundling) by the reaper comes to be the same as for hand cutting.

Trial of the Schutte Seed Drill.—The Schutte drill was compared with the clipper and the country drill. For a depth of about 2 to 2·25 inches, the draft per coulter of the Schutte drill was 24 lbs. as against 17 for the other two, for an adjustment of dropping the seed at every 7·8 inches in the row; the stand of the crop gave 30 per cent. gaps against 41 per cent. in the country drill, but the final yields of grain and fodder from the two sowings were the same from equal areas.

22. *Other experiments.*—In addition to the above systematic experiments, a number of simpler experiments were conducted by the final year students to get practice in field experimentation work. The following results are noteworthy:—

No.	Name of Crop	Nature of experiment	Remarks
1	Cotton	N. R. <i>vs.</i> Banilla (4 replications).	N.R. gave about 27 per cent. greater yield of seed cotton like last year.
2	Tobacco	Satara <i>vs.</i> Gandio No. 6. (5 replications).	Gandio No. 6 gave about 22 per cent. more yield of dry leaf as against about 50 per cent. of last year but the results are not significant.
3	Lucerne	Bed <i>vs.</i> Ridge (2 replications).	Ridge method has given 2·2 per cent. less yield of green fodder than the bed. In the total period of 3 years and 4 months, the ridge method has given only 3·8 per cent. more yield than the bed.
4	Do.	F.Y.M. only <i>vs.</i> F.Y.M. plus superphosphate 300 lbs. (4 replications).	The latter has given 5·7 per cent. more green fodder. The yield on an aggregate of 3 years and 4 months' results shows that addition of superphosphate has increased the outturn by about 2·5 per cent.
5	Kharif grain jowar (Elichpur).	Large grade <i>vs.</i> ungraded seed. (4 replications).	The large grade gave about 13 per cent. more grain.
6	Do.	18" <i>vs.</i> 24" distance between lines. (4 replications).	18" distance gave 16 per cent. more grain and about 10 per cent. more fodder than the latter.

C.—Commercial Working of the College Dairy.

23. Side by side with the primary objects of affording facilities for the practical teaching in Dairying and Animal husbandry to the students of the Poona Agricultural College as well as the operations of breeding pedigree animals of Sindi cows and Surti buffaloes for higher performance, investigation into the scope and methods of Dairying as a business concern has also been kept in view. The working of the year under report is summarised below.

The year under report began with 220 head of cattle and ended with 218, consisting of 23 cows, 30 young cowstock, 75 buffaloes, 55 young buffalostock, 4 cow breeding bulls, 3 buffalo breeding bulls and 28 working cattle.

The following statement shows the performance of the milk animals in the year under report as compared with the previous year :—

Year	Cows		Buffaloes		Average annual yield of milk in lbs. per head on total			
	Total	Milking	Total	Milking	Cows		Buffaloes	
					Actually drawn	After feeding calves	Actually drawn	After feeding calves
1929-30	26·34	22·47	71·28	51·04	3393·5	2943·8	3255·0	3075·0
1930-31	22·11	18·23	68·14	47·74	3065·9	3594·9	3212·9	3127·2

The yield of buffaloes has remained almost the same as last year.

The increase in the average yield per cow by 572 lbs. over that of the last year is due to :—

- (1) low producing cows being culled out to make room for the new comers of high performance,
- (2) this year's new calvers gave more yield than those in the previous year, and
- (3) no irregular milkers.

The financial aspect of the dairy business in the year of report as compared with the previous year is shown in the statement below :—

Year	Total milk produced	Total milk fed to calves	Total milk disposed off	Cost of producing 100 lbs. of milk available for disposal	Money realised per 100 lbs. of milk
	Lbs.	Lbs.	Lbs.	Rs.	Rs.
1929-30	321,403	24,675	296,728	21·05(16·77)*	18·6
1930-31	306,713	14,276	292,437	20·50(16·1)*	18·5

*Figures in brackets indicate cost of producing 100 lbs. of milk excluding charges for land rent, depreciation, difference in valuation of animals and interest on capital.

The total area under fodder crops was 187 acres and 20 gunthas, of which 199 acres and 20 gunthas were cropped only once and the remaining was made up by cropping 39 acres and 20 gunthas more than once. The total fodder produced, averaged about 16,850 lbs. green weight per acre as against 20,000 lbs. during the previous year, the reasons for which are mainly the low yields of most of the crops owing to less quantity of manure given this year as would be seen from the subjoined comparative statement :—

Fodder Crop	Kirkee Dairy			Manjri Kuran		
	Yields per acre		Reasons of difference from 1929-30	Yields per acre		Reasons of difference from 1929-30
	1929-30	1930-31		1929-30	1930-31	
	Lbs.	Lbs.		Lbs.	Lbs.	
Lucerne ..	..	..	....	31,700	26,207	Less Manure.
Green Maize ..	25,900	23,558	Less Manure ..	14,886	12,837	Do.
Green Nilva ..	25,294	22,684	Do.	16,151	13,510	Do.
Green Oats and peas.	20,977	13,125	Warmer season and attack of rust.	16,716	5,800	Warmer season and attack of rust.
Green Hundl ..	..	..	....	30,128	26,365	Less Manure.

Due to the lower yield, the cost of producing 100 lbs. of green fodder has gone up to annas 8·4 as against annas 6·8 of last year.

The area of 38 acres suitable for grazing, furnished full forage to about 43 adult animals for about 62 days from the last week of September to the last week of November as against 50 acres to about 40 adult animals for about 40 days from the last week of October to the end of November of the previous year. An attempt was made to follow rotational grazing in four blocks on a total area of 12 acres, and it carried seven buffaloes for ninety-six days.

D.—Aid and Assistance to the Public.

24. *Supply of Implements.*—Requests for supply of improved implements and their spares still keep coming from various places, inside and outside the presidency. Over 75 enquiries were replied by giving information as to the sources from which the requirements could be got, and only a few implements were made at and supplied from the farm workshops.

25. *Supply of seeds.*—In all over 293 enquiries for seeds and manures from various places were received out of which 83 indents were supplied from the Agricultural College Farm produce and the remaining enquiries were directed to reliable sources. Early groundnuts, N.R. Cotton, Lucerne, Nilva, *jowar* (fodder variety) and a few kinds of vegetable seeds were supplied from the Farm.

26. *Services of Pedigree Bulls.*—During the year the Agricultural College Dairy helped the public by affording facilities of service of pedigree bulls as below :—

Cow Bulls—Sindhi and Gir—32 services.

Buffalo Bulls—Surti—36 services.

27. *Help to other Sections of the College.*—Help in the form of growing crops, supply of labour, seeds, implements and advise on agricultural matters was rendered to various sections at the college and the Agricultural Engineer to Government and the Central Poultry Breeding Farm to the extent possible whenever asked for.

28. *Supply of information to the public.*—In all 264 enquiries on various agricultural questions were replied to. The number of visitors was about the same as reported last year. Besides this, special facilities were afforded as far as possible to the students of the Male Training Colleges, Poona, Female Training College, Poona, Vernacular Agricultural Schools of Leni, Jambool, Dhulia and Kolhapur, and the Nature Study Club, Poona, Indian Womens' University, Poona, and the Shivaji Maratha School.

29. *Demonstrations and Shows.*—The Agricultural College Dairy put up a Dairy Demonstration at the District Agricultural Show at Nasik from 8th to 14th December 1930.

30. *Publications.*—The following is a list of publications during the year :—

(1) GOKHALE, V. G., DESAI, M. M., and DAVE, C. N.—Requirements of concentrates of Sindhi cow yielding up to 10 lbs. milk per day under Deccan conditions—*Journal of Central Bureau of Animal Husbandry and Dairying, Vol. IV. Part II.*

(2) DESAI, H. M.—Review of Experiments in preparatory tillage in the Bombay Presidency—*Poona Agricultural College Magazine, Vol. XXII, No. 3.*

Personal.

31. All the members of my staff have put in the best of their endeavours and abilities in carrying out their duties.

V. G. GOKHALE,
Professor of Agriculture.

APPENDIX I.

SUMMARY OF WORK DONE UNDER THE AGRICULTURAL CHEMIST
TO GOVERNMENT, BOMBAY PRESIDENCY, POONA,
FOR THE YEAR 1930-31.

During the year under report I was in charge of the Office and the Laboratory of the Agricultural Chemist to the Government of Bombay from the 1st July 1930 to the 22nd March 1931 and again from 23rd June 1931 to the end of the year. During my absence on deputation on special duty for three months Professor V. N. Gokhale, B.Ag., B.Sc., acted as Agricultural Chemist to Government, Bombay Presidency, Poona.

The work under the Agricultural Chemist may be divided as usual into following sections :—

- (1) Analytical work done for the public and for various sections of the Agricultural Department and other Government Departments.
- (2) Investigation work.
- (3) Teaching work at the College of Agriculture, Poona.
- (4) Water Finder.
- (5) General.

(a) *Analytical work.*

The analytical work includes actual analysis of samples and also advice given to the public based on the results of analyses. The number of samples received for analysis is very high as in previous years. During the year under report 1,156 samples were received for analysis. This number does not include any sample that was to be done or dealt with in connection with the Research work carried on in the Chemical Laboratory itself. The above number of samples can be classified into sub-heads such as Soils 356, Fertilizers 297, Waters 115, Feeding Stuffs 127, Oil seeds 101, Milk and Milk products 28 and other miscellaneous samples 132.

The samples may also be divided into two groups, viz. : (1) those received from Government Departments and (2) those received from the Public. The number of samples received under the former group is 691 while the number received under the latter category is 465. As in previous years the Economic Botanist lent the services of a Graduate for some time to hasten up the analyses of his Castor seeds.

The samples received from the public consisted of samples of Fertilizers 227, of Soil 83, of Waters 44, of Milk and Milk products 28, of Feeding Stuffs 23, of Oil and Oil seeds 5, and 55 samples of Miscellaneous type.

(b) *Investigation work.*

Investigation of small problems referred to the Agricultural Chemist is included under analytical work and it is only the larger, major and definite problems that are included under this heading.

The problem of the Recuperation of Nitrogen of soils of this Presidency was completed and the results obtained are sent for publication for the Journal of Agricultural Science through the Imperial Research Council.

The study of the "Karl Soils in the Karnatic" was continued as in the previous year and Laboratory and pot experiments were done to corroborate the results obtained. The "Karl" soil was subjected to different treatments and their effect on Soluble salts and on pH value of the same was noted. It has been found that better crop is obtained when the treatments given tend to hold the moisture and also tend to part with it to the crop. There is an improvement in the crop with the lowering of pH.

Manurial Experiments on Rabi Jowar by Professor of Agriculture had led us to investigate "Movement of manures in soils." During the year under report, different soils of this Presidency were treated with artificial manures to observe the movements. There are some results at hand; the work is being continued with different manures.

"Study of the digestibility of Starch from different types of Rice" was undertaken last year. It is a common and a general belief that old rice is more easily digested than new rice and certain types of rice are more easily digested than others. The problem was undertaken with a view to find out the truth in this, if any. The starches on being separated are being tackled only chemically at present. There is no conclusive evidence yet and the work is in progress.

"Investigation regarding disintegration of bones" was undertaken in November 1930. This investigation was taken in hand at the instance of the Imperial Council of Research. The object was to find out the best possible and cheapest way to make the bones brittle and easy for crushing purposes. Raw bones were subjected to a number of treatments and the material obtained afterwards was subjected to a test of crushing in a small ore-crusher. Time and power (Labour) were the factors that were taken into account. The material as it passed through a 2mm sieve was taken as a standard. Substance obtained after different treatments was analysed for Nitrogen and Phosphoric acid. A grant of Rs. 600 from Sir Sassoon David Trust Fund was put at the disposal of the Agricultural Chemist to carry on this work. The work is now practically completed and the results are being put together for publication.

Teaching work.

I am responsible for the teaching of Chemistry and Geology to all the classes of the College of Agriculture, Poona. As often indicated before, the teaching work has considerably increased in recent years and it is becoming almost more and more difficult to keep up the high standard of teaching with the present over worked staff. The addition of a Lecturer or at least a Demonstrator is quite essential.

During the year under report I had three Post-Graduate Students working on three different problems. Two were studying for the M.Ag. degree Examination and one for the M.Sc. degree Examination.

Mr. N. P. Kale who was working for his M.Sc. degree submitted his Thesis to the Bombay University on "A Chemical Study of the Composition of the oil in Niger seed (*Guizotia Abyssiniaca*) and the Bio-chemical study of the oil in the Niger Seed." The work which Mr. Kale had submitted was highly appreciated by the University and Mr. Kale was awarded the M.Sc. degree with distinction.

Water Finder Work.

During the year under report most of the water finder work was curtailed owing to retrenchment. During the major part of the working period of the year, I had only one assistant in charge of the Water Finder Machine. The posts of other three assistants being retrenched since March 1931.

This year 115 sites were tested in all and I have received reports that wells were dug successfully in two places.

General.

During the year under report I myself with the help of my staff was engaged in the investigation of the Problem of "Oil Crushing Industry in the Bombay Deccan". During the investigation that was carried for over four months or so, I was able to find out very valuable and important data. The results of my inquiry were put together and were submitted to the Imperial Council of Agricultural Research.

A small paper was prepared on the "Consumption of Sugar and Gul by rural and town population" for the Tariff Board.

The articles published in the Agricultural College Magazine need no special mention here.

Staff.—I am glad to note that all the members of my staff worked most enthusiastically and satisfactorily throughout the year.

D. L. SAHASRABUDDHE,

Agricultural Chemist to Government,
Bombay Presidency, Poona.

Poona, 15th July 1931.

APPENDIX J.

SUMMARY OF WORK DONE UNDER THE ECONOMIC BOTANIST TO THE GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1930-31.

The Economic Botanist to Government, Dr. W. Burns, returned from leave on October 19th, 1930. During his absence Mr. G. B. Patwardhan, B.Sc., Assistant Professor of Botany, had acted as Economic Botanist. Having attained the age of 55 years Mr. G. B. Patwardhan retired on October 24th, 1930, thus terminating a long and useful career in the service of Government. Mr. L. S. S. Kumar, M.Sc., was appointed Assistant Professor of Botany and joined on May 1st, 1931. Owing to retrenchment one post of assistant economic botanist has been held in abeyance.

Control of Botanical Researches.

In his capacity of advisory officer for botanical work Dr. W. Burns, the Economic Botanist, after return from leave visited the research stations at Surat, Broach, Viramgam and Dharwar, and took part in various departmental conferences on research policy. He also attended the December meetings of the Indian Central Cotton Committee and various meetings of University bodies of which he is a member. A large number of enquiries on matters connected with economic botany were answered, many involving identification of specimens. The public have little idea of the range and diversity of information demanded on questions concerning plants, especially plants other than usual crop plants.

Such enquiries are received from correspondents in India, America, Africa, Australia and elsewhere.

Quite a large number of them relate to the seed supply and cultivation of plants grown for special purposes, e.g. khas-khas grass, various oil-grasses, henbane, Balsa wood, eucalyptus, *Impatiens balsamina*, various fibre plants, etc.

There is another line of enquiries that deals with weed plants and other noxious plants and means of their eradication. Still another line is the identification of plants sent for naming. Generally we are able to do this, and only very occasionally have to refer a doubtful specimen to Calcutta.

The present Economic Botanist is Principal of the College (and his report on that part of his work is published separately) and is Professor of Botany. In this capacity he has been responsible for organising all the teaching in botany for all three years of the degree and diploma courses and for the short course. He himself takes the Advanced Plant Breeding course and delivers occasional lectures to the students of the first and second years.

Research on bajri (Pennisetum typhoideum).

The three races selected in Poona, Nos. 37, 54 and 59, were again subjected to a rigid yield test by Fisher's method against the local variety

and the mixture of forms known as the Akola variety (grown from seed brought freshly from Akola Taluka, Ahmednagar District). The varieties stood in the following order in percentage of increase in grain yield over the local variety, No. 54, 14.3 per cent. ; No. 37, 11.8 per cent. ; No. 59 (strain I), 5.8 per cent. ; No. 59 (strain II) 7.4 per cent. ; Fresh Akola, 4.2 per cent. The season favoured the early variety 54 and local and was not favourable for 59 and Akola. Tests of freshly imported Akola seed against bagged Akola seed that had been grown one year in Poona indicated that the seed grown in Poona for one year was 17.2 per cent. poorer in yield than the fresh seed. There was some indication that hybrid vigour got by crossing two different strains of bajri increased yield. Field tests of the varieties 37, 54 and 59 show that they are not suited to Bijapur District which needs a very late type. In Akola Taluka the varieties did fairly well, but not quite so well as the local Akola. Elsewhere, in Dhulia the varieties stood in the following order. Fresh Akola, Nos. 37, 59, 54, Local, 41.3 (Selection from Dhulia).

Further field tests will be made in the following year especially in areas to which these are likely to be specially suited. For example, No. 54 is undoubtedly an excellent variety for that large tract where rainfall is scanty and a quick ripening high yielding variety is essential. It is probable that in the year 1932-33 this research will be located in some place more typical of the main bajri-growing territory of the Deccan.

Research on grassland.

At Bhamburda the system of rotational grazing using four ten-acre blocks and 20 cattle, was continued. From each ten-acre block grazed this year two acres were fenced off and the grass cut in order to estimate the amount of feed produced and thus judge of the effect of the treatment. The animals were in healthy condition throughout the year and increased in weight till the end of December. There was some falling off of weight thereafter, but this was retarded when silage made from the grass of the area was fed to them during the hot weather. This silage was made in a silo pit excavated on the site, the amount of grass put in being 24,010 lbs. No other food except grass grazed or stall-fed as hay or silage has been given the animals. The vegetation of the Bhamburda area continues to improve. Construction of contour bunds has helped a good deal in checking soil erosion and increasing plant population. This experiment will terminate on December 31st, 1931.

It is gratifying to report that the Forest Department are prepared to try out these methods on a large scale in a grazing area under their control near Poona, and at their initiative a scheme is now under consideration for applying the principles of rotational grazing to an area of land in their control near Diva Ghat (Saswad). If this materialises and proves successful then the co-operation of the forest and agricultural departments will have gone a long way towards solving the problems of prevention of erosion, improvement of forest grazing lands, and better nutrition of cattle, all of which are inextricably bound up with one another.

Research on Castor.

Representatives of each of the 17 groups of pure line cultures referred to in last year's report were again grown during the year to test their purity for various morphological characters. These have all bred true this year also. Eight selections were tested for yield by Fisher's method at Poona. The results are very encouraging. At Vina in Gujarat 6 out of the 8 selections tried in Poona were also tested for yield by Fisher's method. The results are poor as compared to those of Poona because of the very poor nature of the land in the trial plots. The results of analyses for oil contents of the Vina trials are not yet to hand.

This research which has been conducted here since 1925-26 will henceforth be continued at Prantij in the area of the presidency where castor is most grown. This research has been steadily pursued on a definite plan, namely to select, out of varieties suitable commercially as regards shape and size, strains with high oil-content. These we have now got. They are in all nine in number and the performance of practically all of them is consistently high. The work at Prantij will consist largely of a comparison of the *yield* of these high-oil content varieties, and, of course will also mean a check of the oil-content in the new conditions. It is hoped soon to have one variety for rabi and one for kharif conditions that will be really a great improvement on anything hitherto grown.

Seed Testing.

The number of samples dealt with was 286.

Publications.

The following publications by the Economic Botanist or his staff appeared during the year :—

No.	Work	Where published	Author
1	Influence of bagging on oil percentage in Castor.	Poona Agricultural College Magazine, XXII, July 1930.	G. B. Patwardhan.
2	Relation of bloom on Castor leaves with Jassid attack.	Do. ..	Do.
3	Correlation of oil content to presence of colour in the stem of Castor.	Do. ..	Do.
4	The Climbing Mango ..	Poona Agricultural College Magazine, XXII, 3rd December 1930.	Do.
5	Horticultural Research in an Indian Province. (Paper read before the Imperial Horticultural Conference, London, 1930).	Special report of the Imperial Agricultural Bureau, London, 1930.	W. Burns.
6	Ecology of grassland at Trombay near Bombay.	Poona Agricultural College Magazine, July 1930.	L. B. Kulkarni.

No.	Work	Where published	Amount
	<i>Forthcoming</i> A preliminary Note on Inheritance in <i>Castor</i>. Salt and Salting for Grazing Animals.	<i>publications.</i> To be published in the Journal of the Indian Botanical Society, Volume X, No. 1st June 1931. To be published in "Agriculture and Livestock in India."	G. B. Patwardhan. L. B. Kulkarni and L. G. Annigeri.

Dr. W. Burns has prepared in collaboration with the cotton breeders of the Presidency proper a complete list with notes on life history and uses of all cotton varieties grown at our cotton breeding stations. These amount to 122. Dr. Burns has also prepared and sent for publication in the new journal "Agriculture and Livestock in India" an article entitled "The work of the Bombay Cotton Breeders" which is a complete historical survey of all the cotton breeding work done in this department since 1905. A small book on "Grassland Problems in India" by the Economic Botanist and his colleagues is also in preparation.

W. BURNS,

3rd July 1931.

Economic Botanist to Government,
Bombay.

APPENDIX K.

SUMMARY OF WORK DONE UNDER THE CROP BOTANIST TO GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1930-31.

Administration.—Mr. B. S. Kadam was appointed Crop Botanist in April 1930 and held the charge during the year under report.

Mr. S. M. Patel acted as Superintendent, Rice Breeding Station, Karjat, till November 1st 1930, when he was relieved by Mr. V. L. Bhosekar, who held the charge during the rest of the year.

Mr. B. Nazareth held the charge of the Superintendent, Wheat Breeding Station, Kirkee, throughout the year.

RICE BREEDING.

Season.—The rainy season commenced with heavy showers after the first week of June. As usual the July and August months were of heavy rainfall. The rains continued until the end of October interfering with harvesting operations and somewhat spoiling harvested crop in the fields.

The total precipitation recorded during the year was 136.79 inches.

The Season plot of K 42.—The arrangement of the plot was the same as reported in the last year's Annual Experimental Records of the Department.

A number of observations of the four and ten seedling sections were recorded both in the field and laboratory. The growth of plants, flowering, panicle length and fineness of grain, were practically the same for both four and ten seedling sections.

The conspicuous difference between the four and ten seedling sections was in the rate of increase in tillering. Weekly counts were taken. The tillering in four seedling blocks was faster than in the other sets. The net gain of productive tillers in the four seedling hills was twice as much as in the ten seedlings.

As regards yield of grain one of the squares with four seedling compared favourably with the ten seedling blocks. The other one, however, gave significantly less yield; this was certainly due to the fact that it was on a very poor soil.

The average yield of paddy calculated per acre was 2,860 lbs. and that of straw 2,720 lbs.

Hybridized selections.—It was reported last year that the strain K401 (K39 $\times$ K164) was pure. Later on it was found that the flowering and fineness of grain had a very wide and uneven range indicating impurity for these characters. Fortunately, the strain still continued to give high yields.

A number of promising selections have been made from K401.

Strain K403 (K39 $\times$ K164).—Five outstanding selections were grown from last year's material. All of them gave higher yields than the check, K153. The selections are much finer and ripened a week early than the check strain.

Cross 36 (K184 × 104).—There were five selections grown this year from the cross. The early strains K79 and K184 were used as checks. The selections are more fine in grain, have a larger number of tillers and yield higher than the check strains.

Cross 48 (K39 × K42).—A number of selections were grown from this cross. Most of them are breeding true for economic characters. Final selections will be made after one more year's test.

The two plants selected for extremely fine grains from the culture 48-834-79 proved very impure and with a large amount of sterility. These have been rejected.

Cross 50 (K39 × K104).—All the selections from this cross are late and possess much finer grain than the late strain K42. They are, however, slightly less yielding than K42. Some of them are still segregating for one or more economic characters.

Replication Results.

Early Kolamba strains.—Among the replications of early Kolamba, the experiment does not show any significant results, although variety "Ghosalwel" and K401 gave slightly higher yields than the established strains K79 and K184. "Ghosalwel", a very coarse variety, is intended to be replaced by one of the fine Kolamba strains.

Mid-late Kolamba strains.—In this set of replication the new synthetic strains 415-51, 403-38 and 406, were compared with K153 and a local variety "Halwar". The last two gave higher yields than the new strains. The strain 403-38 has very fine grains.

Late Kolamba strains.—Out of the eleven strains replicated only four show significantly high yields. The order of merit is K42, K226, 48/932-40, 48/191-53.

It must be stated, however, that the strain K42 was in the first place this year due to chance alone, as it is credited with excessive yield in one of the replication blocks. K226, though second, gives a uniformly high yield in almost all the blocks.

Zinya strains.—This year the experiment again did not show any significant strain differences. The strains have been discarded in view of the new selections to be taken up from next year.

Bhadas strains.—This year the strain B52 has been superseded by the strain B225. The replication will be continued further.

Moth reaction of early strains.

Only the least affected selections from K79 and K184 were grown and subjected to moth attack this year. They were found to be as much attacked as the unselected lots of both strains.

The strains being pure lines are not expected to show hereditary variation to moth reaction. The experiment will be continued next year.

Milling tests.

Only the standard Kolamba strains were taken for milling this year. Among the early strains K79 gave highest outturn of whole rice. The strains K184 and 401 were about the same.

The strain K153 was very badly broken up during the milling process yielding only 26 per cent. of whole rice.

The late strains K42 and K226 gave about 58 and 51 per cent. of whole rice respectively.

District trials.

Trials in Konkan.—The non-lodging strain K412 and K42 were compared in Bhivandi and Kalyan talukas of Thana district. At both the places K412 has slightly out-yielded K42.

Trials in Nasik.—The strains K79, K184 and K42 were compared with local varieties in Igatpuri taluka. All of them have given appreciably higher yields than the local varieties.

It is complained that the Kolamba strains deteriorate after two years' introduction. It may be interesting to investigate the causes of deterioration.

Trials in Nagar.—In the Rajur village of Akola taluka K42 was compared against "Raibhoga" and "Girwel" varieties. K42 is late by about ten days and out-yielded both the varieties with a margin of 150 lbs.

Quantity of seed distributed.

About 2,500 lbs. of seed of various strains were distributed. Of this 2,017 lbs. were supplied to the Deputy Director of Agriculture, Konkan division, Ratnagiri.

As this section does not deal in seed distribution the requisitions should be sent directly to the Deputy Director of Agriculture, Konkan division, Ratnagiri.

WHEAT BREEDING.*Study of Banshi strains.*

As usual the Banshi strains were studied along with the Nasik local as check. All the strains were found pure and yielding favourably as compared to the local.

Replication results.

The Banshi strains along with Nasik and Charoli locals were replicated both at Manjari and at the Ganeshkhind Botanical Gardens.

At Manjari the strains were badly affected by rust. None of the improved Banshi strains proved superior in yield to either Nasik or Charoli local.

Practically the same results were obtained at the wheat plots in the Ganeshkhind Botanical Gardens.

The "rust-resistant" strains 806, 807, 808 and 809 were replicated along with Pusa 4, Bansi 168 and local at the Ganeshkhind Botanical Gardens.

The last two suffered severely from the black stem rust. The incidence of rust on the "rust-resistant" strains was negligible.

The experiment showed 806, 809 and Pusa 4 to be superior over the local by 18, 11 and 13 per cent. respectively. The per acre yields of Bansi 168 and Nasik local are 175 lbs. and 214 lbs. respectively.

Improvement of Baxi wheat.

During the year under report the F₂ generation of the Kala Khapali 568 X S.P. 33 was grown. Promising selections will be grown next year for further study.

Selections in Nagar wheat.

The selection Saddhe 11 was attacked by rust this year. This was unusual as during the last two seasons it was observed to be appreciably free from rust attack. It is, however, believed that the strain was attacked largely by *Brown* or *Orange* rust, although black stem rust was also present.

New strains.

The seven synthetic selections obtained last year have been designated as 901 to 907.

Unfortunately none of these possess an attractive grain lustre and in yield too, the new selections do not surpass the old ones. However, the best of the new selections will be tried next year.

Hybrid material.

Various improved Bansi strains were crossed with Kala Khapali 568. The F₃ generations were grown this year. High yielding and Bansi-like selections will be grown for further study next year.

District trials.

Trials in Nasik.—Trials were conducted at three villages, Pimpalgaon, Ozar and Sinnar.

At Pimpalgaon the wheats were irrigated twice. The incidence of rust was severe on the local wheat, and slight on rust resistant strains and Pusa 4.

The strains Pusa 4 and 809 out-yielded other strains. The yields are 1,500 lbs. and 1,020 lbs. of grain respectively.

At Ozar the rust-resistant strains and the local were compared. There was no rust in the locality and the strains were grown without irrigation. The strain 809 out-yielded all others.

At Sinnar village, only 809 was compared with Pusa 4 and the local. The yields of Pusa 4 and 809 were 824 and 904 lbs. respectively. The local yielded only about 450 lbs. of grain.

At all the above places farmers seem to like the strain 809 due to its lustrous grain and heavy yield.

Trials in Nagar.—The strain 809 was compared with Pusa 4, Bansi 162 and the local at Khare-Karjune village. The yields of all the strains are very low. However, 809 still gave 336 lbs. of grain per acre ; while Pusa 4 and local gave only 192 lbs. and 170 lbs. per acre respectively. The yield of Bansi 162 was 268 lbs. per acre.

The strain 809 is likely to suit Nagar district.

Trials in Dharwar.—The wheat trials conducted at the Dharwar Government Farm proved nearly a failure. The strains 808, 103 and the local were attacked by rust. The yields were very low, about 120 lbs. per acre.

Comparisons at Bijapur and Gadag showed no appreciable difference between the strain 103 and the local. The strain 103, however over-yields the local by hundred pounds at Chikodi. The yield of the local was only 120 lbs.

Seed multiplication.

About 500 lbs. of seed of various wheat strains was supplied to various centres. The multiplication of the strain 224 has been taken up at the Jalgaon Farm from this year.

JOWAR BREEDING.

The Crop Botanist continued to visit the Jowar Breeding plot at Mohol. Two promising selections have been obtained from the Maldandi jowar. Selection in Dogadi variety has also been taken up.

B. S. KADAM,

Crop Botanist to Government of Bombay, Poona.

APPENDIX L.

**SUMMARY OF WORK DONE UNDER THE PLANT PATHOLOGIST TO
GOVERNMENT, BOMBAY PRESIDENCY, POONA, FOR THE
YEAR 1930-31.**

During the year under report Dr. B. N. Uppal held the charge of the section of Plant Pathology.

Mr. M. N. Kamat continued to act as Assistant Professor of Mycology until 31st March 1931, when he reverted to his substantive post of Assistant Mycologist. Mr. Kamat has proceeded on leave to the United States of America for advanced study in plant pathology.

Government have extended the period of the temporary appointment of Betelvine Investigator at Bassein until 31st March 1933. Mr. J. S. Malelu remained on deputation as Betelvine Investigator, and Mr. M. K. Desai continued to act as Assistant Mycologist.

Dr. M. K. Patel was appointed Rice Mycologist with headquarters Government Farm, Larkana, Sind, in connexion with the Rice Pathological Scheme sanctioned by the Sir Sassoon David Trust. Dr. Patel worked under my directions until December 1930 when the control of the Rice Pathological Scheme was transferred to the Chief Agricultural Officer in Sind, Karachi, on account of the separation of the Sind Department of Agriculture from the Presidency proper.

In order to make a thorough investigation into the wilt in sann-hemp, a temporary appointment of Sann Investigator was created in July 1930, and Mr. N. T. Kulkarni was appointed to it. The scheme is financed from the Sir Sassoon David Trust Fund.

Education.

The Plant Pathologist was assisted by the Assistant Professor of Mycology in the teaching of plant pathology at the College of Agriculture, Poona.

Five out of the seven students specialising in Advanced Plant Pathology were successful in the University examination for the degree of Bachelor of Agriculture. There is one post-graduate student under training. Two applicants were refused admission to the post-graduate course in mycology because of limited facilities.

Research.

1. *Sulphur treatment for powdery mildew of the grape.*—The results of the experiments on the control of powdery mildew by sulphur dusting have been published in Bulletin No. 163 of 1930 of the Bombay Department of Agriculture.

2. *Control of grain smut of jowar.*—In the experiments conducted during 1927 to 1929 inclusive, the sulphur-treated seed was in most cases sown by a pair of forceps in order to have a uniform coating of the

dust on each grain. The question was raised whether the data on smut reduction obtained by this method of sowing would be comparable with the amount of smut in the drilled seed, since, in drilling the treated seed, some quantity of sulphur on the grains was likely to be removed by hand, and this might adversely affect the control of smut. Experiments made on the College Farm have shown that there was no difference in smut reduction in the plots in which the seed was drilled or sown by hand. The amount of smut in the drilled (treated) seed was 0·2 per cent., while it was 0·4 per cent. in the dibbled seed.

Experiments were also made on the College Farm to determine the effect of sulphur applied at rates ranging from 8 to 20 ounces per 60 lbs. of seed. The results have shown that sulphur dust improves the germination of seed and exerts no harmful effect even when 20 ounces of sulphur are used to treat 60 lbs. of seed.

A paper summarising the results of the experiments made during the last four years has been accepted for publication in "Agriculture and Livestock in India".

3. *Jiru mildew*.—Dusting trials were made on the Tobacco Farm, Nadiad, and at Uttarsanda, a village near Nadiad. Four plots comprising an area of 2·75 acres were dusted. It has been ascertained that very effective control of mildew can be obtained if the first application is made just before flowering and the second at the time of seed-formation. The cost of the two applications does not exceed Rs. 5 per acre.

The fungus causing powdery mildew of Jiru (*Oeninum cyminum* L.) is probably an undescribed species of *Oidium*.

Mycelium superficial, branched, hyaline, septate, 4 to 6·5 μ in diameter, forming a dense grayish white coating on all green parts, the seed being most severely affected; *conidiophores* septate, erect, medium stout, tall, single, hyaline, varying from 106·5 to 166·5 μ in length; *conidia* hyaline, rounded cylindric, catenulate, a long chain usually not formed as *conidia* fall off when mature, 35–40·9 $\mu \times$ 13–16·9 μ .

It is proposed to continue the work for another year.

4. *Control of fig rust*.—Trials were made at Poona and Saswad. Sulphur dust of 200-mesh fineness was used in the trials. The results may briefly be summarised as follows:—

(i) Four and five-week intervals show promise of giving effective control.

(ii) The first application should be made not later than 15 days after the first watering.

(iii) Four to five applications are necessary for effective control.

(iv) No dusting should be given later than the last week of February; but if necessary, a light application of sulphur may be made in March.

(v) The quantity of sulphur required to treat an acre varies from 50 to 65 lbs. (for 200 trees).

The experiment will be continued.

5. *Gummosis of citrus*.—A number of fungicides including coaltar creosote were tested at Utran in East Khandesh. Of all the fungicides, Anti-ant and coaltar creosote gave the best results in control. These results and those obtained during the last two years show that coaltar creosote is effective in controlling gummosis, and is more satisfactory than carbolic acid.

Similar tests are being made at Belapur and Rahuri.

6. *Macrosporium blight of Jiru*.—The pathogenicity of *Macrosporium* sp. isolated from blighted plants has been proved. The morphological study of the fungus has also been made.

7. *Wilt in sann-hemp*.—The wilt in sann-hemp has been shown to be caused by a species of *Fusarium*. The prominent symptom of the disease is the wilting of young or nearly mature plants in the field. Infection may take place at any stage in the growth of the plants ; but the fungus may remain more or less in a latent state till the conditions for the development of the disease have become favourable.

It has been shown that the wilt-fungus may be disseminated by non-viable seed, which has been shown to harbour infection. Viable seeds were invariably found to be free from infection.

Some of the different varieties of sann-hemp tested resisted the attack of the fungus in the field and in artificially infected pots. By mass selection a number of resistant plants have been selected, and these will be grown in F3 generation in the rabi season. However, since extensive natural crossing takes place in sann-hemp and since the seed does not form under muslin cages unless the stigmatic surface is artificially stimulated, the problem of selection of resistant plants has been complicated.

8. *Wilt in betel vines*.—Extensive field trials made during the monsoon have shown that the disease can be held in check by a suitable treatment. A number of fungicides were tested ; but Bordeaux mixture was the most effective. This fungicide was sprinkled by means of a watering can at the rate of one gallon per 12-foot row ; but the rate of application was increased to 2 gallons after the vines were lowered. In the four gardens regularly treated during the monsoon (June to September), the disease was effectively controlled. Untreated gardens in the neighbourhood were completely destroyed.

It has been shown that infection of betel vines is chiefly caused by *Phytophthora* sp. during the monsoon, while *Sclerotium rolfsii* causes some damage in the dry season.

The cost of the treatment per acre and the number of applications for effective control are being worked out.

9. *Studies in the genus Sclerospora*.—The following is a very brief summary of the results obtained :—

(i) *Sclerospora graminicola* is split into specialised races. The physiologic form on *Pennisetum typhoideum* does not pass to the species of *Setaria* and *Euchlaena mexicana*, while the form on *Setaria* spp.

can cross-inoculate and also infect *Euchlaena mexicana*, but it cannot attack *Pennisetum typhoideum*.

(ii) *Sclerospora graminicola* var. *Andropogonis-sorghii* can infect maize and *Euchlaena mexicana* besides *Andropogon sorghum* on which it was first described in 1913. The work done during the last four years has shown that this fungus is a distinct species, and it is proposed to rename this fungus.

(iii) Evidence has been obtained that *Sclerospora maydis* is synonymous with *S. philippinensis*. It is proposed to publish this work shortly.

10. *Brown spot disease of rice in Sind*.—During the year 49 treatments were tested on the Government Farm, Larkana, and at Kambar. The most promising treatments were Tillantin and Semesan.

11. *Powdery mildew of peas*.—Trials made during the year have shown that powdery mildew of peas can be completely controlled by two applications of sulphur, the first application to be made a week before flowering and the second when the pods are formed and are flat. The disease, however, was not completely controlled when only one application was made at the flowering time. The untreated plots were destroyed.

It is proposed to continue the work and to test the value of one against two applications.

12. *Virus diseases of plants*.—A scheme on the virus diseases of plants which was put up before the Imperial Council of Agricultural Research for a subvention, has been sanctioned. The scheme will last for 5 years, and it is hoped that the work will be taken in hand shortly.

Advisory work.

A large number of enquiries regarding plant diseases were dealt with during the year, and advice was given promptly whenever required.

Arrangements to demonstrate specimens of plant diseases and the appliances for the control of diseases at the divisional agricultural shows were made in co-operation with the Divisional Deputy Directors of Agriculture.

The plant disease survey of the Presidency is being made, but the progress is slow.

Miscellaneous.

In the past rabi season jowar crop was extensively damaged in East Deccan. In many places damage to the crop was very serious reducing it to a 4-anna crop. *Rhizoctonia bataticola* has been isolated from the affected plants. This disease is also very serious near Broach, and is called there by the local name of "KHARKHARIA". It is suspected that tobacco and cotton also suffer from this disease in Gujarat.

A new virus disease of kulthi, *Dolichos biflorus* L., has been discovered. Like other virus diseases of the leguminous crops, the mosaic of kulthi has been shown to be transmitted by seed.

Alternaria macrospora was found on cotton near Kopergaon for the first time in this Presidency.

Peanut rosette, a virus disease, was reported by Dr. B. B. Mundkur from Dharwar.

Publications.

1. UPPAL, B. N., G. S. CHEEMA and M. N. KAMAT.—Powdery mildew of the grape and its control in Bombay. Bombay Dept. Agr. Bull. 163. 1930.
2. UPPAL, B. N.—*Macrosporium* blight of *Cuminum cyminum* in the Bombay Presidency. Internat. Bull. Plant Protect. 4: 104. 1930.
3. UPPAL, B. N.—Data and information on damage caused to cultivated crops by the cold wave of the winter 1928-29. Internat. Bull. Plant Protect. 4: 149-150. 1930.
4. UPPAL, B. N. and M. K. DESAI.—Physiologic specialisation in *Sclerospora graminicola*. Phytopath. 21: 337-338. 1931.
5. UPPAL, B. N.—Infection of *Setaria italica* by *Sclerospora graminicola* on green foxtail and everglade millet. Internat. Bull. Plant Protect. 5: 26. 1931.
6. UPPAL, B. N.—A new host of *Sclerospora graminicola* var. *Andropogonis-sorgi*. Internat. Bull. Plant Protect. 5: 26. 1931.

B. N. UPPAL,

Plant Pathologist to Government.

APPENDIX M.

SUMMARY OF WORK DONE UNDER THE SOIL PHYSICIST TO
GOVERNMENT OF BOMBAY, MANJRI FARM, FOR THE YEAR
1930-31.

During the year under report Mr. N. V. Kanitkar, M.Ag., B.Sc., held the charge of the office of the Soil Physicist from 1st of April 1930 to 1st of December 1930 and during his absence on leave from 1st December 1930 onwards Mr. V. G. Patwardhan, M.Ag., M.Sc., held the charge.

This is the seventh year of experiments on Dry Farming and second year of experiments regarding the losses of rain water by surface run-off etc. The study of the problem of Dry Farming is continued in the field and in the Laboratory on the lines already laid out.

The laboratory work mainly consisted of the determinations of moisture contents of soils from numerous plots receiving different treatments. Other studies regarding the properties of soils etc. could not be taken up, for want of staff and funds.

Season.—Climatic factor is the most important one, which influences the growth of the Dry crops and thus the yields. The total annual rain and its distribution, plays a very important part. The year under report proved to be a favourable one. The total annual rain amounted to 20·85 inches received on 91 days as against 17·91 inches on 71 days in the last year. The distribution of Kharib rain was not very satisfactory though the rainfall was 11·2 inches (normal being 12 inches) and that of Rabi was satisfactory having rain 8·61 inches. The number of useful rainy days was sufficiently high, namely 37. The Rabi rain more or less well distributed and falling in small amounts each time, was properly absorbed in the soil and thus the conservation of moisture was effected naturally to some extent even in the case where the land was not properly banded and levelled (Cultivator's conditions). The total amount of rain (20·85 inches) falling on a fairly large number of days (91), had effect on temperature and humidity, which minimised the losses of moisture, by way of evaporation from the soil and by way of transpiration from the plants. The combined effect of the above climatic condition, favoured the growth of the Kharib and Rabi crop and thus the yield. Owing to the season being on the whole favourable, no *marked* effect was seen of the methods of Dry Farming influencing the growth and yield of Rabi and Kharib crops as compared to that in the last year.

Kharib crops—Experiments with Bajri and Tur mixture.—Previous year's experiments with Bajri and Tur mixture were repeated in triplicate plots to determine the effect of bunding and mulching. All the plots received ploughing by C.T.2 plough and three harrowings by blade harrow. Three rows of Bajri with one row of Tur were sown at a distance of 18" between the rows. There were two series of experiments with check plot. (1) Bunds with no mulch, 1" mulch, and 2" mulch, (2) no bunds with no mulch, 1" mulch and 2" mulch and (3) the plot under cultivator's conditions as check of one guntha in each case. There were

plots to see the effect of addition of farm yard manure and of fallow in comparison with the results of the standard method of bunds with 2" mulch. Under cultivator's conditions, Tur crop was found to suffer, as there was not sufficient moisture available in the soil at the later stage. The plot was patchy and the growth uneven.

There was marked difference in the yield of Tur, the increase in yield by Dry Farm method being 84 per cent. over that by cultivator's method. There was no appreciable difference in yield of Bajri grain. The results are given in the adjoining table.

Other Kharib crops.—Cotton and Nilwa jowar were tried on a small scale. The bundled plots gave comparatively better yields to those of non-bundled.

Rabi crop.—The experiments were carried with Shalu-jowar (variety "Kalbondi") being the most important crop on the Dry Farm. All the experiments of the previous year were repeated and replicated three or four times according to the availability of land and some new experiments were added during the year under report.

Regarding the growth of Rabi jowar in general it can be said that the stand was more or less uniform in all the plots.

In December last between 27th to 30th, 1930, there was a sudden change in climatic condition and the cloudy weather which followed had a very bad effect on the jowar crop. All of a sudden the leaves were seen affected with rust (*Puccinia Purpurea*). No preventive or curative measure has been found out yet as it is considered to be a minor pest. It will be better if disease resistant varieties are bred.

The different series of experiments with jowar crop :—(The results are given in the adjoining tables).

(1) Bundled series with different mulches.—This year the yields with bundled plot and 2" mulch did not give higher result as had been the case for the last three years (10 per cent. lower yield in comparison with other plots). This goes to show that the limiting factor of the thickness of mulch varies from 1" to 2" to 3" according to the seasonal factors, specially rainfall and its distribution.

(2) Non-bundled series with different mulches.—Here 2" mulch plot gave 7 per cent. higher yield compared with no mulch. In comparison with bundled series the yields are lower by 30 to 40 per cent.

(3) Manurial series.—Bundled plot with 2" mulch and farm yard manure was found to yield more, possibly due to the rain being well distributed.

(4) Cultivation series.—Ploughing the land by any of the ploughs or cultivators, had decidedly better effect compared to that of harrowing by blade harrow. All plots gave nearly double the yield of that of the harrowed plot. Fallowed plot gave 11 per cent. higher yield as compared to the standard.

(5) Cultivator's plot when compared with the standard in the same series, was found to yield nearly half in the weight of grain.

(6) *Economic series.*—This year was specially an abnormal one owing to the sudden fall in prices to such an extent that the value of the produce realised, was lower than the cost of production and hence no profit and loss was calculated. The losses could not be reduced by the higher increase in the outturn owing to the fact, that the extra value realized was not enough to make good the extra expenses.

District trials.—These were tried by the district staff under the guidance of the Deputy Directors and the Soil Physicist.

In the South Central Division, the experiments were carried at Mohol Farm, in Sholapur district and at various places on Cultivator's fields in Poona and Ahmednagar districts.

At Mohol Farm, the results (given in the adjoining table) show that the ploughing is highly advantageous to any other treatment and it has given increase in the yield of grain by 175 per cent. over cultivator's (or 2.75 times that of cultivator's).

In Ahmednagar district, the experiments were tried at 41 centres. The area cropped with Dry Farming methods was 195 acres and that with the local methods, as check was 116 acres. The average yield per acre by Dry Farm method was 429 lbs. as against 254 lbs. by local method. Thus the increase in the yield came to 70 per cent.

In Poona district, the experiments were centred near about Talegaon Dhamdhare of Sirur Mahal, but the trials were taken on 20 different plots. The area cropped by Dry Farm methods and by the local methods was 92 acres in each case.

Average yield per acre by Dry Farm method.. 418 lbs. grain.

Average yield per acre by Local method.. 226 lbs. grain.

Thus the increase in the yield came to 84 per cent.

In the Southern Division, the experiments were carried (1) at Bijapur proper and (2) at Khatijapur, on four-acre plots under different treatments of cultivation such as, use of (1) plough, (2) harrow, (3) Time tooth cultivator etc. The results are given in the adjoining table.

The results are in conformity to what obtained last year and are as expected. At Khatijapur the differences are not so very marked, as they are at Bijapur. This is due to the later operations not being followed by the cultivator as instructed. The owner of the land had instructed his tenants but they did not care to follow the methods except the first operation.

Propaganda Work.—The demonstration and propaganda work on Dry Farming has achieved a great success in South Central Division and much more so in Ahmednagar district.

There has been a big demonstration of the Dry Farming methods at Mohol Farm with the ocular demonstration of the crops showing the advantages of Dry Farming methods over the local method.

There were District Agricultural Shows held (1) at Oudamber near Tasgaon in Satara district, (2) at Adlas near Sangola in Sholapur district and (3) at Mirajgaon near Karjat in Ahmednagar district. Illustrated

lectures with crop demonstration wherever possible, were given by the Soil Physicist at the above shows and demonstrations. A number of practical demonstrations on cultivator's fields were arranged by the Agricultural Department with the co-operation of Revenue officers at several places in Poona and Ahmednagar districts. The Deputy Director of Agriculture S. C. D. and the Soil Physicist attended many of these and convinced the people by way of talk and Crop demonstrations the benefits of Dry Farming methods.

Other investigation work.—(1) *Surface run-off and Soil erosion*—The year under report is the second year of the experiments of determining the losses of rain water by surface run-off and of soil erosion. These were laid out on the same plan as that of Duley and Miller at Missouri with the necessary modifications according to the local conditions. The soil selected is medium black (loam) having a slope 3 in 100, and only in one direction. An area of half a guntha ($66' \times 8.25'$) was taken for each treatment. There were six such plots receiving different treatments, namely (1) untreated or bare, (2) Harrowed, (3) Ploughed lengthwise, (4) Ploughed crosswise (listed), (5) Ploughed and harrowed with Bajri and Tur crop and (6) Ploughed and harrowed with Rabi Jowar crop.

The total annual rainfall was 20.85 inches distributed over 91 days. The number of days on which run-off took place was 10 and the rain received during these 10 days amounted to 8.84 inches. If we take into account the rainfall of 10 days namely 8.84 inches when run-off took place, we find that the water lost amounted to 40 to 52 per cent. of the heavy rains from plots which were not cropped, 24 per cent. from plots cropped with Bajri and Tur and 37 per cent. from plot cropped with Rabi Jowar. The results are given in the adjoining table.

(2) *Rain water lost by underground drainage.*—The experiments regarding the losses by drainage were only started this year. There were two sets of Lysimeters, each being $10' \times 10'$ having one 3 feet in depth and the other 5 feet in depth. One had soil put to a depth of 18 inches and the other, to a depth of 3 feet, with a percolating layer of shingles below in each case. The soil layers were arranged as they were in the adjoining land *in situ*. Only about 1 acre inch of water was found to be lost by drainage from the lysimeter having soil of 3 feet depth. There was no loss of water by drainage through the other (having 18 inches of soil). This is due to the leak at the bottom, somewhere in the cement concrete bed. This will be investigated and the experiments continued next year.

(3) *Water utilized by the crop.*—Some preliminary experiments are carried out and it is found that the study of the water requirements of crop in the field, is a complicated one and will have to be dealt with as an independent problem. Hence the figures of preliminary trials are not given.

(4) *Soil moisture study.*—From the plots of the cultivation series, the determinations of moisture and pore space, were made at every month, from the beginning of rain (from 9th June 1930) to the end of Rabi rains (to 9th January 1931). The results did not show appreciable

variation and hence no conclusion can be arrived at, at present unless the results are obtained for two or three years more. From other experimental plots, the moisture determinations only, are being done, before and after rains, and before and after crop. The results will be given in the experimental records.

(5) *Other experiments.*—Some preliminary experiments were carried out last year for finding out the rise of water in the soil by capillarity force. This was arranged in small pots. The results showed that the rise of water by capillarity goes on from the bottom layers to the top layers for the first three or four weeks and then later on, when the bottom layer contains about 18·0 per cent. to 20·0 per cent. of moisture the rate of upward movement is very slow. From this stage onwards there was not much difference seen in the moisture contents in the different layers from the point of the capillarity rise and hence further determinations were not done.

The detailed study had to be left for want of funds. Since the knowledge of the movement of water in the soil by capillarity action is very important and of very wide application it should be taken up this year and the funds should be made available to the extent of Rs. 500 at least (being approximate estimate).

Staff.—The work of investigation at the Manjri Dry Farm research station and the field trials on cultivator's fields and propaganda work by way of lectures and demonstrations in the district, is increasing day by day and the existing staff are trying their utmost to cope up with the increased work and responsibilities with scientific accuracy ; but it will be hardly possible to carry out the programme of experimental and other work with the present inadequate staff unless some part of the work is omitted or unless some additional hands and funds are provided.

Mr. G. M. Bapat, M.Ag., graduate assistant, had put in very hard and strenuous work with scientific spirit. The non-graduate assistant Mr. Gadkari and other staff worked with zeal and co-operation.

V. G. PATWARDHAN,

Soil Physicist to Government of Bombay.

Statement showing the yields of Bajri and Tur for the year 1930-31 on Dry Farm Experimental Station at Manjri, tried in triplicate (results are given from the middle square calculated per acre).

Treatment	Bajri Grain lbs. per acre	Bajri Fodder lbs. per acre	Tur Grain lbs. per acre
Cultivator's plot	497.4	2,264.0	205.0
Flat and no mulch	411.0	1,848.9	290.0
Flat and 1" mulch	524.8	2,414.9	431.6
Flat and 2" mulch	503.4	1,981.0	386.6
<i>Bunded series—</i>			
Bunds and no mulch	387.9	1,894.4	380.0
Bunds and 1" mulch	485.2	2,830.0	446.6
Bunds and 2" mulch	516.4	2,462.1	377.5
Bunds and 2" mulch and addition of F. Y. M. ..	580.1	3,396.0	402.5
Bunds, 2" mulch and fallow in 1929 ..	636.0	2,830.0	..

Statement showing the yields of Rabi-jowar per acre in 1930-31 on Dry Farm Experimental Station at Manjri, tried in four replications (results are given from the middle square calculated per acre).

	Grain lbs. per acre	Fodder lbs. per acre
<i>Bunded series—</i>		
No mulch	1,038.1	3,152.5
1" mulch	1,144.3	2,700.0
2" mulch	916.2	2,508.1
3" mulch	1,031.0	2,551.0
<i>Flat series—</i>		
No mulch	799.0	2,408.4
1" mulch	736.1	2,322.3
2" mulch	859.5	2,166.8
3" mulch	830.5	2,452.6
<i>Manurial series—</i>		
Bunds and 2" mulch and F. Y. M. ..	1,432.7	3,554.9
Bunds, 2" mulch and Sann Green Manure ..	660.4	1,857.7
Bunds, 2" mulch and Amonium sulphate ..	1,179.6	2,853.4
Bunds, 2" mulch and Nitrate of Soda ..	1,038.5	2,782.9
<i>Cultivation series—</i>		
Ploughing with C.T. 2 Plough	1,181.2	3,084.1
(Shallow ploughing) sabul Plough	1,241.1	3,310.3
Tine tooth harrow	1,209.6	3,376.8
Blade harrow	645.7	3,090.1
Cultivator's plot (with seed sown with 9" drill) ..	504.6	2,863.5
Large scale trial (sown with 18" drill. Bunded and intercultured with bullock hoes). ..	705.5	1,846.2
Bunds and 2" mulch and dibbled 18" apart ..	815.8	2,105.4
<i>Fallow series—</i>		
Bunds and 2" mulch	1,313.5	3,861.8

Statement showing the yields of Rabi-jowar per acre on the Experimental plots on cultivator's fields in the Districts during 1930-31.

Poona District.

Area cropped with Dry Farming Methods 92 acres.
 Area cropped with Local Methods 92 ..

Plots 20 at Talegaon-Dhamdhare (in Poona District)				Average yield of grain lbs. per acre	Yield of fodder lbs. per acre
Dry Farming	..	..	..	418 (92 acres)	992
Cultivator's	..	..	..	226 (92 acres)	1,052
Difference	..	..	..	192	— 60

Ahmednagar District at 41 centres.

Area cropped with Dry Farming Methods 195 acres.
 Area cropped with the Local Methods 116 ..

Plots 41 centres in (Ahmednagar District)				Average yield of grain lbs. per acre	Average yield of fodder lbs. per acre
Dry Farming	..	..	..	429 (195 acres)	1,204
Cultivators	..	..	..	254 (116 acres)	929
Difference	..	..	..	175	275

Statement showing yields at Mohol Farm in Sholapur District.

Treatment	Grain lbs. per acre	Fodder lbs. per acre	Remarks
Cultivator's methods	224	772	Average of triplicates of plots (one acre each). Do.
Harrowed	490	1,122	
Ploughed	611	1,105	

Statement showing yields at Bijapur and Khatijapur in Bijapur District.

Treatment	Bijapur		Khatijapur	
	Grain lbs. per acre	Fodder lbs. per acre	Grain lbs. per acre	Fodder lbs. per acre
Deep Ploughing	1,120	1,286	263	468
Harrowed	661	1,200	260	441
Cultivator's plot (as check)	485	1,266	237	430
Shallow Ploughing	725	1,280	..	..
Tine tooth harrow	632	1,360	..	..

Statement showing losses of rain water by surface run off over land with slope 3 in 100 for 1930-31.

(Manjri Farm, total rainfall—20·85.)

No. of days of heavy rains	Quantity of rains	I Untreated	II Harrowed	III Ploughed	IV Listed	V Ploughed harrowed with Bajri and Tur	VI Ploughed harrowed Rabi Jowar	Remarks
	Inches							
10	8·84	4·42	4·63	4·28	3·57	2·12	3·34	
		50·0%	52·3%	48·4%	40·3%	23·9%	37·7%	Of heavy rains (8·84 inches).

Soil lost by heavy rains (per acre).

Soil ..	Tons	Tons	Tons	Tons	Tons	Tons
	13	14·1	19·0	12·27	2·16	5·8

APPENDIX N.

SUMMARY OF WORK DONE UNDER THE LIVE STOCK EXPERT TO GOVERNMENT, FOR THE YEAR 1930-31.

Charge.—Mr. Edw. J. Bruen held charge of the Office of the Live Stock Expert for the complete year.

The work of the Live Stock Expert and his staff covers the following :—

- (i) Advisory work.
- (ii) Propaganda and teaching in villages.
- (iii) The breeding of pure strains of cattle on Government farms.
- (iv) The placing out in villages of Premium bulls, both from farms and purchase.
- (v) Holding of demonstrations and shows.
- (vi) Sheep and goat improvement.
- (vii) Improvement of the milch buffalo.
- (viii) Propaganda in making and using silage.
- (ix) The conducting of simple feeding experiments to ascertain value of food-stuffs, both concentrates and roughages.
- (x) The improvement and breeding of certain foreign breeds of poultry on the Central Poultry Farm, Kirkee.
- (xi) The placing out of improved fowls and eggs into villages.

Advisory work.—This comprises the drawing up of plans and estimates for Dairy and Poultry farmers, the visiting and advising of Dairy farms, Gowshalas and Poultry farms. This type of work is also done for neighbouring small States.

In collaboration with the Deputy Director of Agriculture, Konkan, Ratnagiri, a scheme is being evolved to overcome the present unsatisfactory milk supply of Bombay by planning out the starting of a Dairy District in Palghar taluka of the Thana District. This problem is of great moment to the livestock of the Presidency, as the present method involves the premature slaughter of very useful cattle.

Propaganda.—Propaganda on the keeping, breeding and rearing of better cattle was carried out in over 200 villages, the Live Stock Expert having visited these villages at least twice during the year, being out on tour in the district for 147 days.

Demonstrations.—During the year silage making and feeding demonstrations were conducted as follows :—

Northern Division	..	..	2
Central Division	..	..	2
Southern Division	..	..	3

Over and above this, silage was made and demonstrated at Chharodi, Sangvi, Bankapur and Kandivlee farms. These demonstrations are now bearing fruit. Several pucca silo pits have been made by Societies and individuals at places, where demonstrations were held.

Shows.—Shows were held as follows :—

		Number of Shows helped financially and with advice	Number of Shows helped in organisation and advice
Northern Division	.. ..	..	..
Central Division	.. ..	1	2
Southern Division	.. ..	5	2
Sind	.. ..	1	..

A Poultry Show held in Poona by the Bombay Presidency Poultry Association was also helped in organization and finance.

Unfortunately owing to financial stringency, very little financial help could be offered ; but it has been encouraging to notice that the people themselves have come forward with finance to enable us continue this real good work. Where we have been able to establish such Shows, the improvement in cattle has progressed rapidly.

Breeding Operations in the District.—Although the cattle breeder and the cultivator has been badly hit by the world's depression in agricultural products, the demand for bulls has been maintained, and we are still unable to meet the demand for bulls. The breeders have found it difficult to maintain bulls and in many cases assistance in the form of more maintenance had to be given.

We have not as yet been able to get over the difficulty of getting breeders to maintain and rear their male progeny, these are sold when weaned and it is difficult to obtain such, as breeding bulls. This much however, is certain that a large number of these males, especially in the Central and Southern Divisions are maintained by the purchasers as entire bulls. In the Northern Division to save such male calves, a number are purchased annually and reared up at Chharodi Farm ; if this was not done, these would be lost for further breeding, as early castration is practised in Gujarat.

Premium bulls.—Owing to financial difficulties, it has been necessary to further cut concessions usually given for Premium bulls. It has however, been found necessary in the dry Central Division to give maintenance charges as the breeders find it extremely difficult and expensive to keep breeding bulls. To maintain the progress already made, it will be essential to continue Government help. It is now getting difficult to persuade people to keep breeding bulls in these dry tracts. With all this, our demand far exceeds our powers of supply. The

statement given below shows how the Premium bulls are located in the Presidency :—

Zone	No. of bulls working on 1st July 1930	No. of bulls whose period expired during the year	No. of bulls put out during the year	No. of bulls on hand on 1st July 1931
<i>Intensive Breeding Zones.</i>				
Chharodi	23	5	12	30
Surat	3	1	7	9
Satpura	6	..	..	6
Sholapur	5	3	9	11
Belgaum	1	..	2	3
Bankapur	11	1	9	19
<i>The rest of the Presidency—</i>				
S. C. D.	..	..	..	..
N. C. D.	12	10	..	2
S. D.	2	2	2	2
Gujarat	10	6	4	8
Konkan	6	4	..	2
Grand Total ..	79	32	45	92

The steady but sure improvement in those villages in which we are working is now becoming very noticeable, and what is more satisfactory still is that the reputation of such villages as good cattle villages is spreading. All Co-Operative Cattle Breeding Societies in "A" Zone were visited twice by the Live Stock Expert himself and on several occasions by the District staff.

Palghar Dairy Farm.—The Palghar Infants and Public Milk Supply Co., Ltd., is making steady progress under the guidance of the Live Stock Department, for the 3rd year in succession a profit and dividend has been declared. Further progress can and it is hoped, will be made. The farm was inspected and a report submitted to Government.

Sheep breeding.—No progress has been made in sheep improvement during the year. There are great possibilities in the sheep industry; better breeding, better care and shearing and better marketing would yield handsome returns. None of these is possible without a Government breeding farm, where a suitable sheep could be bred and experiments conducted.

Poultry.—The keeping, breeding and rearing of better poultry is on the increase. The demand for better poultry is increasing. It has been possible this year to start marketing the better egg and table fowl. Mr. L. K. Kirloskar at Kirloskarvadi has found markets, and he now regularly sends eggs and poultry to Bombay. Fowls, cocks, chickens and eggs were sold at concession rates in Poona, Ahmednagar, Satara, Sholapur, Bijapur and Thana Districts.

General.—The whole staff under my control have worked well during the year, under rather trying circumstances.

I make special mention of my 2nd Clerk Mr. Y. K. Phadke, who has worked very well during the year, being out with me on tour. Mr. M. M. Desai at Chharodi has done good work.

Northcote Cattle Farm, Chharodi.

Staff.—Mr. M. M. Desai, B.Ag., managed the farm during the whole year. The Assistant Manager Mr. B. B. Jamaspjina, B.Ag., acted as Manager of the Government Central Poultry Farm, Kirkee, for a period of about seven months, and Mr. Desai had to carry on single handed.

Season.—The monsoon set in slightly later than usual, the major portion of the rains coming in a short period from 4th July to 10th August 1930, after which there was no rain to speak of, so on the whole the season was not satisfactory.

Fodder crops.—Local Jowar, Bajri, Maize and several kinds of pulses were grown during the year. Last year's observations have been substantiated again this year.

- (a) Local Jowar has proved its superiority to any other variety. It thrives best under all conditions in this tract. Local Jowar must however, be sown early.
- (b) Maize will not stand heavy rains; in a badly drained soil, it is doubtful if it is an economical crop for this area.
- (c) Bajri similarly will not stand the low lying conditions of Chharodi, where water lodging is inevitable.
- (d) Pulses once again have proved a failure. All are too expensive to grow and watch against wild animals.

Hay-making.—Owing to financial stringency and due to the fact that the farm had a big storage of hay, half the standing crop was sold for Rs. 2,400, the farm making only a few thousand lbs. of hay. The area which was accidentally fired last year grew a better crop this year.

Ensilage.—Silage-making was taken up on the 18th August 1930 and finished on the 22nd September 1930; 4,25,000 lbs. of silage was made from green grass, green Jowar and green Maize; and packed in 3 pucca and 3 cutcha pits.

Irrigated fodder crops.

Elephant grass.—This crop is in its sixth year, and has done better this year than the previous year, yielding 83,169 lbs. per acre. This crop thrives best in the monsoon, and does fairly well in the hot weather, but in the winter the growth is practically retarded. It should, therefore, not be relied on as a source of green fodder in the winter.

Oats.—Oats again did well. Early sown Oats in October, which was a hot month failed but a subsequent sowing in November did well, yielding as much as 25,787 lbs. per acre. The yields obtained may possibly be due to Oats following Berseem in rotation.

Berseem.—Berseem was sown on an one acre plot; the yields this year were slightly less, only 28,749 lbs. were obtained per acre. The smaller yield is possibly due to the land; this plot being slightly heavier soil than the year previous.

Maize and Chavli.—This mixed crop was sown in February, and again on a second plot in April. The later sown crop yielded 32,000 lbs. per acre as against 25,000 lbs. of the earlier sown plot. The land lay fallow for a year, and possibly the yields were due chiefly to this rest.

All crops were manured with farm yard manure at from 20 to 28 cart-loads of farm yard manure per acre.

Livestock.—Progress in improvement.

This year 66 cows in milk yielded 1,17,327 lbs. 12 ozs. of milk as against 74 cows yielding 1,42,680 lbs. in the year previous (i.e.) an average yield in the year under report of 1,879 lbs. 8 ozs. per cow as against 2,044 lbs. 8 ozs. in the year previous. The decrease is due to the following :—

(1) An outbreak of Hæmorrhagic Septicæmia in July, when all cattle were inoculated 3 times.

(2) This year's young stock did not do well as the young stock of previous year.

(3) The erratic season played a great part in the reduced yields. Mosquitoes and other injurious flies appeared in larger numbers than usual.

The progress of improvement is however, maintained.

The following 6 cows have yielded over 3,000 lbs. of milk during the year :—

Serial No.	Name and Brand No.	Yield in lbs.	No. of days in milk	Remarks
1	Ravti, 20 of 1921 ..	5,006·0	279	Calf suckling.
2	Meghan 1 of 1923 ..	4,813·8	261	Calf suckling.
3	Bodti, 33 of 1926 ..	4,583·12	302	Calf died.
4	Waghen, 336 of 1917 ..	3,809·0	291	Calf suckling.
5	Vijli, 16 of 1924 ..	3,362·8	333	Calf suckling.
6	Vijli, 14 of 1923 ..	3,204·8	248	Calf died and the yield dropped.

(4) The results of breeding bulls are being watched carefully. The results this year are much the same as reported the year previous.

Strength of the herd during the year stood as given below :—

Stud bulls	..	..	3
Cows	..	..	82
Heifers	..	..	53
Young bulls	..	..	64
Bullocks	..	..	39
Cow-calves	..	..	31
Bull-calves	..	..	38
Buffalo-bullock	..	..	1

Total .. 311

Early maturity.—No advance on last year has been noticed ; the age of calving for the first time being on an average of 4 years.

Births.—During the year 29 males and 35 female calves were born. The percentage of calving is nearly the same as the previous year.

Disease and Casualties.—This year has been an unfortunate one as far as disease is concerned. Hæmorrhagic Septicæmia claiming 14 deaths and Rinderpest 10 deaths and 11 deaths for other causes. A type of paralysis appeared in rather a severe form this year due possibly to the excessive rain in a short period.

All due precautions of inoculations etc. were taken and the disease kept well under control.

Our thanks are to Mr. E. S. Farbrother, Superintendent, Civil Veterinary Department, who took prompt action in each case.

Sales.—A large number of animals, 78 in number were cast and sold during the year. The average price realized was Rs. 48-5-7 as against Rs. 54-2-6 in the year previous. The shorter prices realized are possibly due to the depression in the market.

Premium bulls.—The farm issued eleven Premium bulls during the year.

Visitors.—Many distinguished visitors visited the farm during the year, among whom was Col. A. Olver, Animal Husbandry Expert, Imperial Council of Agricultural Research.

General.—The year has been very trying for the staff, who have worked very well, being as they were short-handed.

Cattle Breeding Farm, Bankapur.

Staff.—Mr. A. B. Gadagkar, G.B.V.C., held charge of the farm for the whole year.

Season.—The early part of the monsoon was favourable and timely for the sowing of crops. There was a lengthy break from August to October, when good rain saved a critical situation. The crops were affected by the long break.

Grasses.—In the early monsoon a bumper crop of grasses and grazing was anticipated, but owing to the long dry period *Ischaemum Laxum* and *Andropogon Contortus* were badly affected by the break, and the yields were far below normal. It was not possible to make hay, as the requirements of silage only were obtained. The grass lands at Kalasgeri were also badly affected. The October rains, however, provided good grazing for the whole herd at Kalasgeri.

Hay-making.—It was only possible to harvest 64,263 lbs. of hay at Kalasgeri this year as against 1,05,020 lbs. the year previous. The cost of harvesting was reduced considerably by using mowing machines, the harvesting charges amounting to Rs. 1-10-0 per 1,000 lbs. as against Rs. 2-14-0 the year previous. There is no doubt that the mowing machine is a great asset in making hay.

During the year two Brazilian grasses (a) Gordura and (b) Jaraguay were sown as a trial. These grasses have a reputation of being very draught resisting. On the farm without irrigation three cuttings were obtained, which yielded approximately 3,440 lbs. green. Seeds were collected and the grasses will be tried on a larger scale.

Live-stock.—The following table shows the comparative strength of the herd with the year previous :—

			1929-30	1930-31
Stud bulls	..	..	4	3
Cows	..	..	51	40
Heifers	..	..	29	30
Young bulls	..	..	33	25
Bullocks	..	..	9	10
Cow-calves	..	..	22	16
Bull-calves	..	..	21	10
Total ..			169	134

During the year there were 49 services recorded and 35 calvings as against 38 services and 29 calvings the year previous. The average weight of calves at birth was 43 lbs., showing good normal births.

Improvements.—The herd is now improving rapidly. The farm is now using one of its own bred bulls, with the result that the colour and markings of cattle are now uniform. The light coloured animal is now predominating, and it is hoped from now onwards, we shall have no further trouble with this colour problem.

Early maturity.—The young stock females are now mating at 3 years 6 months, a great advance on previous years.

Regularity of calving.—The farm bred stock are now taking the bull fairly regularly. Five cows since 1926 have calved regularly each year, this regularity of calving is very necessary in producing an economical animal.

Sale.—During the year 21 animals were cast and sold; these did not conform to our requirements. The price of bullock has gone down considerably in this tract with the reduction of price of agricultural products.

Disease.—There were two outbreaks of disease on the farm. Black Quarter and Hæmorrhagic Septicæmia, which were responsible for 11 deaths on the farm. All due precautions were carried out under guidance of the Civil Veterinary Department. There were other six deaths due to accident, debility, etc.

Petty Construction.—During the year 12 loose boxes 12' × 15' with a small run of 50' × 12' were erected, in which to keep young bulls, as by tying together, these did not do well. The loose boxes have proved a great success. There is no doubt now that for raising a number of bulls on a farm, these must be kept separate.

Farm machinery.—During the year a 5 B.H.P. Crude Oil Petter Engine was installed, as the large old engine was costly to run. The table below gives the comparative cost of these two engines; this has been a great saving to the farm.

Type of Engine	Oil used per hour	Grease per hour	Lubricating per hour.	Water pumped	Total cost per hour
		Oz.	lb.	Gallons	Rs. a. p.
Ingeeco	K. oil 3 lbs. Petrol $\frac{1}{2}$ lb...	$\frac{1}{2}$	$\frac{1}{2}$	500	0 6 11
Petter	Crude oil $1\frac{1}{2}$ lbs. ..	$\frac{1}{2}$	$\frac{1}{2}$	643	0 2 4

Ensilage.—During the year five cutcha pits of silage were made from the following crops :—

	lbs.
Grass	28,588
Maize	72,376
Jowar	1,72,063
Bajri	98,792

Total .. 3,71,819

Podder crops.—The area reclaimed and brought under cultivation is 28 acres against 27 acres the year previous. This reclamation is a long tedious business, as the area being a fort, which was built of stone and mud; the clearing of the land of stone is expensive and a lengthy process. The chief crops grown were Maize, Jowar and Bajri. In addition to the above Lucerne, Guinea grass and the Brazilian grasses are grown as permanent dry crops. Kulthi was grown as a second crop on two plots. The yields of crops this year were lower than the year previous, owing to the bad lengthy break in the monsoon.

General.—The staff have all worked well during the year and the progress in livestock and cultivation has been well maintained.

Central Poultry Farm, Kirkee.

Staff.—Mr. S. R. Zaidi, the permanent Manager was absent from the farm for 6 months and 26 days on sick leave, Mr. B. B. Jamaspjina, B.Ag., held charge during the absence of Mr. Zaidi.

Farm.—The farm is located on the Poona-Bombay Road on 6 acres of land transferred from the Agricultural College Dairy. During the year two double-sided runs for breeding stock, four chicken runs and the inner-partitions of the single testing pens were erected. Twelve small houses are required to complete the testing pens. The farm is still short of some essential buildings.

Strength of Flock.—During the year one Rhode Island Red cock and two hens were added to the flock. Mr. Bruen presented the farm with one White Wyandotte cock and one hen imported from England.

A statement attached shows strength of flock during the year under report (*vide* Appendix I). The performance of flock is given in Appendix II.

Incubation.—Again during the year considerable difficulty was experienced in incubation. It is very difficult to control the humidity in the incubator house. Attempts will be made this year to ascertain temperature at which eggs should be stored before incubation, humidity, etc. Attached statement (*vide* Appendix III) shows results of incubation and results obtained from 3 types of incubators used.

District work.—During the year the farm sold into the district at concession rates the following:—

Adult birds	..	..	..	13
Young stock	..	..	..	27
Chickens	..	..	..	50
Eggs for hatching	..	..	..	425

During the non-breeding season 6,418 table eggs were sold to customers.

During the year 5 students were given a short course in practical poultry farming; one has taken to commercial poultry farming in Bombay, one has gone to Basra for the same purpose and a third has gone to England to further his studies.

This industry is gradually but surely gaining ground; one can see cross bred birds almost in all parts of the Presidency.

The Bombay Gowrakshak Mandali, Kandivlee.

The Mandali is still doing very good work. There is little doubt that the example set by this institute to convert the present Panjrapole into useful institutes has had great effect. Nearly every institute in the Presidency worth the name is trying to copy the good work of this Mandali. Very many prejudices have been overcome.

The following figures of cost of production of milk are very interesting, which go to prove what can be done by systematic breeding.

In the year 1928-29, the price of producing 1 lb. of milk including all charges such as raising young stock, etc., was 3 annas 8½ pies; this has gradually decreased to 3 annas 1½ pies per lb. cost of rations being the same. The actual cost of producing milk, taking into consideration only the productive milking herd was being decreased from 1 anna 11 pies in 1928-29 to 1 anna 9 pies.

The above figures also show what a drain on the resource of a farm the raising of young stock is; but as the institute is out to benefit the country, the cost is justified. The Mandali is anxious to increase as quickly as possible its herd of good Gir cattle.

The Mandali produced 33,297 lbs. 12 ozs. of milk in the year 1925-26 as against 71,017 lbs. 8 ozs. in the year under report. Below is a list of 13 of the best cows and their yields during the year :—

Serial No.	Name of Cow	Yield in lbs.	No. of days in milk	Remarks
1	Vanganga	5,121·4	452	Calf suckling.
2	Draupadi	5,027·0	392	Without calf.
3	Gori I	4,767·8	437	Without calf.
4	Jangori	4,018·8	358	Calf suckling.
5	Rupen	3,997·12	360	Without calf.
6	Pandeo II	3,923·0	402	Calf suckling.
7	Bhagvati	3,724·4	403	Calf suckling.
8	Kashi	3,667·8	259	Without calf.
9	Lekhan	3,583·4	309	Calf suckling.
10	Kailas	3,212·12	335	Without calf.
11	Jambhilli	2,982·4	332	Aborted.
12	Saraswati	2,968·0	345	Calf suckling.
13	Lalgeri I	2,855·8	390	Calf suckling.

Silage.—The Mandali made 4 pucca pits of silage, which proved of great value in keeping up the milk yield during the hot months of the year.

Shows.—The Mandali again financed a Thana District Cattle Show at Dombivli, which was very well attended, and created quite a good deal of enthusiasm amongst the breeders of this part of Thana District.

General.—The institute was this year visited by Mr. J. H. Garrett, Commissioner, N. D., Col. A. Olver, Animal Husbandry Expert, Imperial Council of Agricultural Research, and Col. J. Matson of the Military Dairy Farms. All these were very surprised to see what good work was being done at this institute. Col. Olver was so impressed that he was anxious to try and multiply such institutes all over India. Col. Matson, who is a keen breeder, was surprised to see this fine Gir herd, and said, he never believed that such work could be done in a Panjrapole.

The Honorary Secretaries Mr. Motilal Kanji Kapadia and Rao Saheb Harjivan Valji are to be congratulated on the work they are doing.

E. J. BRUEN,

Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX I.

Statement showing the strength of flock during the year.

Serial No.	Breed (adults)	Sex		Total
		Cocks	Hens	
1	W. Leghorn	3	25	28
2	Australorp	1	6	7
3	Rhode Island Red	1	7	8
4	Wyandotte	1	6	7
5	Basra .. ..	....	5	5
	Total ..	6	49	55

Serial No.	Breed (under year)	Sex		Total
		Cockerels	Pullets	
1	W. Leghorn	1	....	1
2	Australorp	5	7	12
3	Rhode Island Red	2	10	12
4	Wyandotte	2	1	3
5	Basra .. ..	....	....	..
	Total ..	10	18	28

Serial No.	Chickens	Total	Grand total of flock
1	W. Leghorn	40	161
2	Australorp	1	
3	Rhode Island Red	21	
4	Wyandotte	11	
5	Basra	5	
	Total ..	78	161

E. J. BRUEN,
Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX II.

Statement showing the average yield of different breeds.

Breed and Strain	Average No. of birds laying per month	Yield						
		April	May	June	July	August	September	October
Australorps	18.6	81	74	104	109	145	131	123
Wyandottes	4.5	42	33	49	44	31	16	6
Rhode Island Red	5.25	12	19	22	13	23	19	15
White Leghorn								
" Prince of Wales.	6.58	30	33	116	51	127	118	106
" Ransford and Pensford.	10.8	131	126	122	59	112	95	110
" Dewar and Canadian.	11.0	103	76	97	88	134	107	154
" Goodwin Process.	6.5	..	..	..	..	..	..	..
Bantams	6.0	..	..	..	..	..	..	..

Breed and Strain	Average No. of birds laying per month	Yield—contd.					Average monthly yield per bird per month
		November	December	January	February	March	
Australorps	18.6	98	60	82	122	114	7.61
Wyandottes	4.5	9	42	96	93	126	11.22
Rhode Island Red	5.25	27	47	69	84	123	7.6
White Leghorn							
" Prince of Wales.	6.58	84	36	72	104	100	12.7
" Ransford and Pensford.	10.8	135	61	72	93	96	9.36
" Dewar and Canadian.	11.0	136	46	123	126	91	10.0
" Goodwin Process.	6.5	..	53	81	76	100	12.1
Bantams	6.0	..	73	64	82	56	11.46

E. J. BRUEN,
 Live Stock Expert to Government,
 Bombay Presidency, Poona.

APPENDIX III.

Statement showing the Incubation Results.

Serial No.	Date of Hatch	Kind of Incubator	Total charge	Per cent. of Infertiles	Per cent. of Hatch of the total charge	Per cent. of Hatch of the Fertiles
1	29th October 1930.	Hearson's ..	72	48.6	2.7	5.4
2	7th November 1930.	Phipp's ..	70	48.5	21.2	41.7
3	20th November 1930.	Hearson's ..	76	64.4	3.9	11.1
4	29th November 1930.	Phipp's ..	77	35.0	41.5	64.0
5	11th December 1930.	Hearson's ..	77	32.4	33.7	50.0
6	21st December 1930.	Phipp's ..	80	43.7	27.5	46.8
7	2nd January 1931.	Hearson's ..	110	45.4	7.2	13.3
8	13th January 1931.	Phipp's ..	90	28.8	5.5	7.8
9	26th January 1931.	Hearson's ..	120	42.5	5.8	10.1
10	8th February 1931.	Phipp's ..	90	40.0	17.7	29.6
11	20th February 1931.	Hearson's ..	107	38.3	22.4	36.3
12	3rd March 1931.	Phipp's ..	83	26.5	39.7	54.1
13	13th March 1931.	Buckeye ..	64	36.0	25.0	39.0
14	16th March 1931.	Hearson's ..	108	34.2	39.7	60.5
15	27th March 1931.	Phipp's ..	95	42.1	24.2	31.9
16	5th April 1931.	Buckeye ..	65	37.0	30.7	48.7
17	6th April 1931.	Hearson's ..	93	51.6	10.7	22.2

E. J. BRUEN,
Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX IV.

Statement showing stock of birds, chicks and selling eggs supplied to Government-stations and out-stations.

Serial No.	Government Station	No. of birds or chicks	No. of out-stations	No. of birds or chicks
1	District Agricultural Overseer, North Thana, Palghar.	6 Cockerels	Satara	2 Cockerels. 2 Pullets.
2	Manager, Settlement Bijapur.	1 Cock 1 Hen	Ahmedabad	2 Cockerels. 1 Cock.
3	.....	.....	Bhusawal	1 Cock. 4 Hens.
4	.....	.....	Bombay	1 Cock. 4 Hens. 1 Cockerel.
5	.....	.....	Igatpuri	1 Cockerel.
6	.....	.....	Poona District	13 Cocks and Hens. 50 Cockerels and Pullets.
Total		8		82

E. J. BRUEN,

Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX O.

SUMMARY OF WORK DONE UNDER THE AGRICULTURAL ENGINEER
TO GOVERNMENT, BOMBAY, POONA, FOR THE YEAR 1930-31.*Introduction.*

I was in charge of the office of the Agricultural Engineer to Government for the whole year under report, and as I am shortly proceeding on long leave preparatory to retirement, I consider it advisable to review the activities of my department during the last 19 years and trace its development and observe the progress made since its infancy. When I arrived in January 1913, six to seven men including myself constituted the department and when I took charge of the duties of the Agricultural Engineer very few people knew what the functions of the department were. With the exception of a few units at the Government Farms, very little use of modern machinery had been made. Consequently the first few years were devoted to the study of the country's needs in agricultural engineering and experiments were conducted on the lines indicated by my predecessor, Mr. A. A. Musto, C.I.E., who held charge of this office before I arrived. The first experiments conducted were in connection with mechanical cultivation and two steam plough tackles were run departmentally. One set was worked in Dharwar District and we ploughed to a depth of 16 to 18 inches for the eradication of Hariali and Kunda weeds, the other set was worked in Kaira District of Gujarat for ploughing, cultivating and harrowing with different implements principally for bringing several thousand acres of forest area under cultivation, which could not be done by the indigenous or local methods. The area dealt with in Karnatic amounts to 3,973 acres and 26½ gunthas and in Gujarat to 3,792 acres and 14 gunthas with an aggregate yield of Rs. 96,641-13-10 and Rs. 68,417-15-3 respectively. As the object was not to make money, the work was undertaken on concessional charges at some sacrifice to Government. The demonstrations were abandoned because it was not thought necessary to continue them indefinitely, as an important fact had been established, viz. if deep ploughing is resorted to, the eradication of Hariali can be accomplished.

Power Pumping.

As regards power pumping a demonstration pumping plant was installed on the river Bhima at Nangaon in Poona District to demonstrate to the public the use of pumped water from a river for irrigation purposes. The plant was run by the department until 1929 when it was closed down because the concessional water rates were not sufficient to cover the whole expenditure, and the cultivators were unwilling to meet the deficit. Government, therefore, did not think it wise to work the plant indefinitely at a loss. In addition to this several plants have been installed for cultivators and also at various Government Farms and schools wherever there was a possibility of demonstrating a power pumping unit.

Workshop and Experimental Well.

With a view to conduct experiments satisfactorily both with regard to mechanical cultivation, pumping plant, etc., a workshop was added to the activities of the Department. This shop was equipped with men and necessary machines in order to execute necessary repairs and assist power plant owners in case of erection, accidents and breakdowns. The staff was increased as the necessity arose and the total strength in 1919 was 81, including 63 on the permanent establishment and 18 from contingencies.

The experimental well was fitted with various types of water lifts with a view to give cultivators and any interested person an idea of pumping devices at different heads so as to enable them to judge the most likely machine for their requirements and locality.

Advice.

When the cultivators appealed to the Department the following items were given free of charge :—

1. Inspection of sites.
2. Submission of estimates.
3. Drawings and designs for plants to be erected.
4. All technical advice pertaining to machinery.
5. Erections of plants.
6. Advice in case of repairs and breakdowns.
7. Periodical supervision whenever possible.
8. Recommendation of tagai loans for feasible schemes.
9. Training of cultivator students in engine driving.

As several Government Farms are established to impart education and information to the agriculturists, it was also thought advisable to utilise the farm to impart knowledge to the agriculturists in machinery, and with that object in view the majority of farms and schools were fitted with pumping plants, cane crushing plants, chaff cutters, gins, etc., according to local needs, facilities and availability of funds.

Boring.

Boring activities were taken up in 1908 and continued until November 1930 when that section was closed down due to financial stringency.

Fodder Preparing Machinery.

The first fodder baling and bruising plant of its kind was installed at Kopergaon farm in 1916 for converting kirbi to bhusa and pressing it into suitable bales without the aid of gunny cloth. The bales thus produced were very useful for transport purposes in case of famine. This plant was greatly appreciated by the Military Authorities during the War as it turned out a sample which they never expected, in fact it was considered to be too fine a sample.

War duties.

During the War I was appointed as Deputy Controller of Mesopotamia requirements and I prepared nearly 150 large sized pumping sets, duly tested and complete with drawings etc. for despatch to Mesopotamia. This meant much additional work on the already overtaxed department.

Famine.

The year 1918-19 was a very strenuous year for my department, and river sites had to be surveyed and 23 pumping plants of different sizes were installed at different sites in the Presidency.

Reduction in expenditure.

The war came to an end about this time and expenditure was cut down in all directions. The workshops at Dapuri though started later than the Agricultural Engineer's workshop, seemed to overlap the Agricultural Engineer's shop and the result was the cutting down of the latter to a minimum and limiting the actual machine shop function to purely small departmental works, modifications of implements and the teaching of college and oil engine class students. Thus a big consignment of men and machinery passed out of my hands. Later as the result of closing down the steam plough tackle a further reduction of staff was made and the temporary men engaged during famine time were dispensed with.

Growth of the Department.

Since the activities of the Department continued to grow and as the demand for research on implements was becoming more insistent it was decided to distribute the executive work of the Agricultural Engineer to the several Deputy Directors of Agriculture with a view to enable the Agricultural Engineer to devote more time to research on implements. The introduction of the Devolution Scheme in 1923 reduced the technical strength of this office to a considerable extent, but the working of the Devolution scheme did not come up to expectation and the responsibility of the Agricultural Engineer was not by any means reduced and he was greatly handicapped on account of the transfer of staff.

Famine sites.

Since the famine of 1918-19 Government issued orders for the Agricultural Engineer to investigate the possibilities of raising fodder on big river sites in the Presidency by employing suitable pumping installations and this necessitated the inspection of sites on rivers all over the Presidency which added greatly to the Agricultural Engineer's duties as no additional help was given for the work. However the inspection of 129 sites have been effected without detriment to his other activities.

Power baling.

The preservation of pressed fodder at a good Kirbi centre in normal years to save cattle as a famine measure was considered to be an important

subject and the Fodder Baling Plant at Karajgi in Dharwar District was introduced, and an installation consisting of 12 NHP Steam engine, 40" Bruiser, with elevator, Hydraulic Press, with platforms, counter-shaft, 2,000 feet of tram line, servants' quarters, office and store room, machinery shed, and one big storage shed measuring 120' $\times$ 45' $\times$ 14', a weighing room with a cart weigh bridge, fencing, culvert, a bore hole power pump etc., etc. was erected departmentally at a total cost of Rs. 80,753. A Hydraulic Press is employed in the plant in preference to a belt driven press similar to the one at Kopargaon with a view to get greater density and greater output. The maximum capacity of the plant is 400 pressed bales of 80 to 85 lbs. each in a day of 10 to 12 hours working. Operations were conducted for two seasons and a half in the years 1925, 1926 and 1927 and 60,130 bales weighing about 66,262 tons were baled and stacked at Karajgi. Since the operations started there has been no famine and the demand for fodder is insufficient to warrant such a costly plant working year after year. Operations were closed down in June 1927 but the plant is kept in reserve as a famine measure.

Tractoring.

Experiments with tractor ploughing were conducted in Karnatic, Gujarat and Khandesh when tractoring was in its infancy. The later types of machine are greatly improved and further experiments are essential on a larger scale.

Famine boring.

The Famine Boring Scheme was started in 1925-26 and 12 Portable Power Machines and 45 Hand Machines were kept directly under the control of the Agricultural Engineer in addition to other machines in the Divisions and the total aggregate footage to date from the commencement of boring operations amounts to 210,863 feet 11 inches giving fresh water supply of 3,138,459 gallons per hour. This added immensely to the work of the Department as I had to carry on with limited staff until November 1930 when the whole boring operations in the Presidency were closed down as a measure of retrenchment. This necessitated a reduction of staff and the services of 110 temporary men and 13 permanent men had to be dispensed with.

Thus the Department was at the zenith of its strength in 1919 and since then a series of cuts in staff have been effected and old experiments and activities discontinued. New activities however are commencing and the result is only what could be expected. Thus the work became unwieldy and several important activities suffered heavily for want of adequate attention. The staff has been heavily taxed and the closure of boring has added to our difficulties, as it has robbed the department of old and useful men. I have been greatly inconvenienced as the result of these unforeseen and uncontrollable events, especially as I was instrumental in starting these expansions having had all the spade work to do and when success seemed secured, along came retrenchment.

Work in Sind.

I must not overlook the great amount of work done in Sind during my regime of 19 years. In addition to equipping the farms with necessary machines the Agricultural Research Station, Sakrand, where most of my attention was centred, absorbed a good deal of time and energy. A duplicate pumping installation on the jack pit connected to the Dhand, two big Tube Wells, the installation of a special Tube Well Turbine Pump on the first Tube Well, a high efficiency Horizontal Centrifugal Pump on the second Tube Well, a raised tower and tank, and two machinery sheds are some of the important works worth mentioning. Another important work was the designing of a special soil sampling machine which was made for Sind conditions and extensive experiments were conducted.

Design of Machinery and Implements.

As regards the work done on Implements I must admit from long experience that it is not a work which can be confined to any time limit. We have to patiently conduct innumerable experiments on various designs before a satisfactory model can be determined and in some cases it takes years to arrive at such a model. I have been able to design a new seed drill, a winnower, a soil sampling machine and a spear grass extractor, also innumerable modifications to other implements such as Pumps, chaff cutters, gin, etc.

The above is a brief review of the work done during the past 19 years and I must admit it was only possible with the good will and co-operation of my staff. I now turn to the activities done during the year under report.

I complained in my last report that the question as regards reorganisation of boring was not decided, and that the work had greatly suffered in consequence. Now however the unexpected closing down of boring activities has brought that difficulty to an end but it has not relieved the staff problem, on the other hand it has deprived this office of experienced men and the work of winding up boring activities and storing of machines, checking stores etc. still demands special attention.

Advice and Education.

Trade depression and closing down of boring seems to have affected the number of technical inquiries, as we had only 45 this year against 167 last year and 138 the year before. Of the 45 inquiries received 20 were for pumping, 2 for cane crushing, 1 for ginning, 1 for motor plough, 2 for oil mills, 1 for tractor driving, 1 for chaff cutting, 1 for repairs and 15 were of a general nature. There were 10 applications for admission in the oil engine class and all received the necessary training.

Tractor Class.

With the help of Messrs. Burmah-Shell Oil Storage and Distributing Co. of India Limited, Messrs. William Jacks and Messrs. Volkart Brothers, a tractor class was opened this year for training cultivators, college students and others in the handling of tractors and ploughs and 4 tractors, viz. the Austin, the Sanderson, the Caterpillar, and

the 15-30 McCormick Deering were employed for the purpose. Messrs. Burniah-Shell were kind enough to find all the oil and fuel and Messrs. Volkart Brothers and William Jacks were good enough to supply tractors and ploughs and sent their expert mechanics for a period of 2½ months to assist in teaching the students in the management of the machines. The total number of applications for admission was 58 of these only 32 were admitted. 17 actually joined the class and 5 left during the course. Reasons given were that it was hard work and too hot in the fields. Of the remaining 12 three left during the examination and of the remaining 9 seven were successful. The test was rather severe and a pass was not allowed unless 80 per cent. marks were obtained. This I considered essential because the men turned out should be really capable and useful drivers. I noticed while coaching the students that the course was found to be too short for the desired standard of efficiency. The term should be at least 3 months and the Department must possess its own machines as the firms may not be able to continue their patronage indefinitely.

Estimates.

Six estimates for pumping were supplied including the revised estimate of a pumping unit for the Utran Scheme. In addition two estimates for chaff cutting plants, one portable for the Deccan and the other semi-portable for Khandesh, were submitted and machinery purchased for both divisions. The plants consist of a 5 BHP Spring Injection Hopper Cooled Blackstone Crude oil engine and a Richmond and Chandler Power Chaffcutter fitted with 2 knives and a feed web. One of the plants is mounted on a trolley while the other is on a steel frame. Both are self contained and are combined plants.

Site Survey.

I have inspected 21 sites on rivers during the year under report and I am appending herewith a statement giving details of those approved.

I have paid three visits to the tractor in Sholapur District and four to the tractor in Khandesh and have also visited the following farms and schools for periodical inspection :—

1. Geneshkhind Botanical Gardens.
2. Manjri Farm.
3. Jalgaon Farm.
4. Dhulia School.
5. Loni School.
6. Gokak Farm.
7. Bankapur Farm.
8. Kumtha Farm.
9. Sirsi Farm.
10. Devihosur School.
11. Mohol Farm.
12. Surat Farm.
13. Kopergaon Farm.

Boring machines were also inspected.

The drawing office turned out 101 drawings during the year.

Research and Experimental Work.

Seed drill.—The new seed drill has passed through many stages during the year under report, and in order to rectify certain defects in the drill and make it adaptable to all conditions in the country the Director of Agriculture appointed a committee to examine the modifications made from time to time.

During these modifications a drill on the clipper principle was made and fitted with the improved seed box and cone pulley drive. During actual sowing operations, however, the machine rolled quite a lot and several contrivances were made to overcome this difficulty and keep the drill steady and properly balanced, but to no purpose, so it was decided with the consent of the Director of Agriculture and the committee that the original improved and patented design of drill should be taken as the basis for further modifications. Later two models of the completed design were tested, one at the College Farm and another at the Mohol Farm during the Rabi season. One model after being worked at Mohol was sent to Jalgaon Farm for Wheat sowing. The trials at Mohol Farm and in the cultivators' fields revealed that the total yield by the improved drill is 9·3 per cent. of grain and 13 per cent. of fodder more than the country drill and the even distribution of the drill as compared with the country is 10 per cent. superior.

As regards germination the improved drill has done well and shows a distinct improvement over the country drill, and is practically equal to the dibbling principle and is better than the actual dibbling on test.

The following are the additions and alterations made during the year under report :—

(1) Provision of an effective lifting arrangement having telescopic handle and spring clips.

(2) The shape of original seed box is slightly altered and an additional box with an agitator provided to maintain the seed level automatically by means of a gear drive and carry a day's supply.

(3) The wooden split beam is superseded by a 2½" angle iron having holes drilled to take the coulters for any spacing.

(4) A new cone pulley designed and fitted to give a wide range of seed rate and a new rope tightening arrangement fitted.

(5) A quadrant with several holes is designed and fitted to change the angle between the pole and the coulters to suit different depths in different soils with varying heights of bullocks.

(6) The foot rest for the driver in the old design is dispensed with and the scraper or covering blade is fitted nearer the beam.

(7) Angle iron spuds are fitted on driving wheels as they are found to be more useful in preventing slippage and a new design of wheel scraper is introduced and fixed.

(8) Several designs of coulters have been made with and without wings and tried under different conditions.

(9) The bracing changed to suit the new design.

The drill like all other machines is still imperfect in some respects. Although it is certainly superior in uniform distribution to the country

drill, and practically as good as dibbling. There is still room for improvement and I have devised a model at the shops to demonstrate the seed dropping from the coulter on to the surface of a moving belt representing the field and I am experimenting with different designs of cup to arrive at the best results.

The correct design of coulter is an important factor in seed drill construction as the least obstruction to the seed in the coulter affects uniform distribution and if the shape and angle are incorrect, there is excessive resistance from the soil and the result is increased draft. These facts have been fairly established recently during test with different shapes of coulters in combination with a quadrant adjustment and experiments are still in progress.

The finished model of the drill will sow any kind of seed ; to any depth, from zero to 6 inches ; to any width of rows ; at any seed rate from 3 to 80 lbs. per acre ; can be drawn by a good pair of bullocks ; and being all steel the present model affords very few chances of breakdowns, and having a covering blade dispenses with an extra implement, 2 bullocks, one man, and sometimes two to three women. Trials both on Khariff and Rabi crops are at present being conducted in 4 divisions and at the College.

Winnower.—The improved winnower is now fitted with special sieves to deal with Bajri, Jowar and Wheat and under instructions of Director of Agriculture was sent to Khandesh for exhaustive tests which were conducted in Erandol Taluka in the villages of Dhanora and Pastana and the following are the results :—

Threshed Jowar winnowed	lbs.	20,200
Cost of winnowing per 1,000 lbs. ..	Rs. a. p.	0 2 7
Sale value of winnowed grain by the improved machine against the indigenous method	12½ per cent. more.	

Average outturn per hour	lbs.	1,000
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Trials on Bajri at 2 places in Parola taluka, Khandesh, gave the following data :—

Threshed Bajri winnowed	lbs.	11,991
Cost of winnowing per 1,000 lbs. ..	Rs. a. p.	0 3 7
Sale value of winnowed grain by the improved machine in comparison to indigenous method	10 to 12 per cent. more.	
Average outturn per hour	lbs.	650

The machine was tried on paddy at Karjat Farm and the Superintendent states that the quality of stuff turned out by this machine is decidedly superior to the local method.

Trials on Wheat showed that the rotating drum for Jowar and Bajri was unsuitable for Wheat and one specially made of wire gauze was found to be satisfactory. The top riddle was also found to be unsuitable; hence another made of wire gauze having 25 holes to the square inch was found to be more useful. The outturn with Wheat was 300 lbs. of grain per hour and the cost of winnowing 1,000 lbs. amounted to 10 annas and with hand winnowing by local method 15 annas. Wheat stuff requires a much stronger air blast than Jowar or Bajri, consequently the fan revolutions had to be increased. Similarly one operation does not suffice to obtain a clean sample but the time taken with the second operation is practically negligible, roughly 1/10th of the first. Successful winnowing requires (1) proper threshing and (2) constant feeding. One great defect noticed in winnowing by the country method is the blowing of bhusa some considerable distance due to strong wind, consequently most of it is lost whereas the winnower blows it to a reasonable distance so that it can all be recovered and used as fodder for cattle. The percentage of grain to bhusa turned out by the winnower ranges as under:—

Wheat	..	35 per cent. grain and 65 per cent. bhusa.
Jowar	..	90 per cent. grain and 10 per cent. bhusa.
Bajri	..	65 per cent. grain and 35 per cent. bhusa.

Reaper.—A Krupp Reaper was tried at the College Farm and at the College Dairy. Both Jowar fodder and Jowar grain crop were selected for the test and heavy pair of bullocks were hitched to the machine. It was noticed that the reaper cuts stalks varying from 3/8" to 1" in diameter with a draft of 2·17 cwts. The time required to reap one acre ranges from 2·6 to 3 hours. Faults noticed are that it is too heavy for one pair of bullocks and if the crop is tangled or lying on ground 6 to 7 men are required to pull out the stalks and clear the tract for a subsequent trip. Further experiments are, therefore, necessary with a lighter machine to ascertain its utility as compared with the sickle.

Experiments with harrows, hoes, ploughs and cotton stalk extractor and groundnut raiser are in progress and as soon as results are obtained, details will be reported.

Tractoring in the Deccan.

A new 26-40 H. P. model L Case Tractor was purchased during the year under report for plowing Deccan areas and on conducting Preliminary tests in Poona it was found that improvements in various directions were necessary in order to ensure satisfactory work. The improvements made are:—

- (1) A suitable awning to protect the driver from sun and rain.
- (2) A new set of driving wheel spade spuds as the original spuds were found to be useless.
- (3) An additional tool box and tools.

- (4) A spring clutch to hold the rope of the self-lift arrangement.
- (5) A set of road tyres for transport purposes.
- (6) A new silencer to deaden the exhaust.
- (7) Reinforcing the spokes of the hind wheels.
- (8) Aceteline lamp for night duty.
- (9) An instrument to record automatically the time the tractor is worked.

The tractor was worked in Sholapur district under new organisation and the season's figures are as under :—

	Days.
Duration of the season was 4 days in February and from 14th March to 30th May 1931	82
Actual working days	44 $\frac{3}{4}$
Days spent otherwise—	Days.
Sundays and Holidays	12
Breakdowns and repairs	9 $\frac{1}{4}$
Rainy days	6
Shiftings	7
Other causes	3
	37 $\frac{1}{4}$
Area ploughed in the season	302 acres 15 gunthas.
	Rs. a. p.
Expenditure incurred	2,752 8 3
Amount recovered as ploughing charges at Rs. 5, 6, 7 and 8 according to depth ranging from 6" to 10"	1,926 0 0
Average cost per acre ploughed	9 1 7
Average cost per acre received	6 4 7

Groundnut Digger.—This machine was sent to Karad taluka for test and was much appreciated by the agriculturists. The machine is found to be heavy for one pair of bullocks and a lighter machine is in progress.

Spear Grass Extractor.—The spear grass extractor has been tried in Satara district and is greatly appreciated by the cultivators especially in the Khatav and Man talukas. It was noticed that two bullocks are not necessary as one bullock can easily work it. A one bullock arrangement is therefore under construction for further trials.

Framotex Steel.—A new material called Framotex steel has been introduced to replace certain parts in the construction of implements and so far the results are very promising. For instance I have replaced the ordinary axle on a 3 furrow tractor plough with a Framotex axle and the results so far show no sign of bending even when working under harsh conditions.

Other works undertaken and completed are:—

- (a) A new design of fowl cages were made and supplied to Mr. Bruen, Livestock Expert to Government.
- (b) Testing of "Kapax" Brick to comply with report required by Government.
- (c) Testing of iron ploughs in co-operation with the Professor of Agriculture, College of Agriculture, Poona.

The works on hand are as under:—

- (1) Improvements and modifications on the Power Sprayer at Sirsi in Karwar District.
- (2) Betlenut Drier.
- (3) Groundnut Raiser.
- (4) New plough.
- (5) New combined Thresher and Winnowing.

Boring.

It is unfortunate that a useful section of work like Boring had to be closed down on account of financial stringency. Many cultivators in the Presidency have had the advantage of boring and many are really disappointed now because boring operations are closed.

The fact that hundreds of additional acres have been brought under cultivation as a result of boring in many parts of the Presidency goes to prove how useful this section really was. Apart from this, number of villages in the Presidency have been saved from water famine during bad years and the districts most likely to suffer are the following:—

- | | |
|--------------|----------------|
| (1) Dharwar, | (5) Sholapur, |
| (2) Nagar, | (6) Poona, and |
| (3) Bijapur, | (7) Nasik. |
| (4) Satara, | |

Unfortunately orders for closing down were received just at the beginning of a new season, consequently the programme laid down had to be cancelled but a few works that were already in hand had to be completed, details of which will be seen from the statement attached.

The winding up of boring operations will entail a lot of extra work which includes dismantling, packing and transport to the specified centres, viz. Poona, Karajgi and Nadiad. Then assembling for ascertaining repairs and finally tests and painting.

So far two Musto Power Machines have been sold and 2 Hand Machines are likely to be disposed of very shortly.

Sind.

The second Tube Well finished last year at the Agricultural Research Station, Sakrand, has been fitted with a high efficiency 6 inches Gwynne's Centrifugal pump, in a specially built masonry sump about 28 feet below ground level and driven by a portable steam engine through a counter-shaft. A shed fitted with asbestos roof covering is also provided for housing the machinery and protecting same from sun, rain and dust. The pump is expected to give 700 to 750 gallons of water per minute as

compared with 350 to 375 gallons from the 1st Tube Well, the latter being fitted with a Vertical Spindle Turbine Pump. The discharge is likely to vary according to variation in the subsoil water level and also water level in the Dhand near by. The idea of the 2nd Tube Well is to duplicate the 1st Tube Well and carry out the irrigation programme without a break when the Dhand runs dry.

During my tour to Sind this year, I visited the following farms for periodical inspection of machinery and to make alteration wherever necessary :—

- (1) Willingdon Cattle Farm at Malir.
- (2) Jacobabad Farm.
- (3) Mirpurkhas Seed and Fruit Farms.
- (4) Larkana Farm.
- (5) Landhi Farm.

General.

Total receipts of the department including pumping, boring etc. amount to Rs. 6,412-7-7.

As I am leaving India on long leave I consider it essential to place on record my great appreciation of the work done by the members of my staff who have spared no pains in helping to carry out the work on hand and those who require special mention are the following :—

- (1) My assistant Mr. C. G. Paranjpe,
- (2) Mr. V. Y. Chitale, my Senior Boring Overseer,
- (3) Mr. N. V. Modak, my Junior Boring Overseer,
- (4) Mr. S. D. Chitale, my Workshop Superintendent,
- (5) Mr. V. R. Utgi, my Head Clerk, and
- (6) Mr. G. R. Kulkarni, my Storekeeper.

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

Statement showing particulars of Famine Pumping sites (in

Serial No.	Name of District	Name of Taluka	Name of Village	Name of River	Area available in acres
1	Satara	Karad	Khubi	Krishna	150
2	Do.	Do.	Nadshi	Do.	157
3	Do.	Tasgaon	Brahmanal	Do.	200
4	Broach	Broach	Zadeshwar	Narbada	150
5	Do.	Do.	Tawra	Do.	150
6	Do.	Do.	Kadod	Do.	150 to 200
7	Do.	Do.	Zenor	Do.	150
8	Dharwar	Haveri	Benchinhalli	Vardha	150
9	Poona	Haveli	Manjri Khurd	Mula Mutha	150

Note.—2nd and 3rd class sites are not suitable as fixtures but are fit for

Bombay Presidency) approved during 1930-31.

Approximate total lift in feet	Size of pump and power of engine required for full available area	Survey No.	Remarks
50	6" Centrifugal Pump ..	19	Very good (1st class).
87	Do. ..	68	III Class site.
60	Do. ..	10	Do.
25	Do. ..	118	Do.
45	Do. ..	400 and 405	III Class site. People unwilling.
45	7" Centrifugal Pump ..	445	III Class site.
40	6" Centrifugal Pump ..	496	II Class site.
95	Do. ..	Savnur Acharya	III Class site.
93	Do. ..	101	III Class site.

portable units. These are the only possible sites out of 21 surveyed.

W. M. SCHÜTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

AGRICULTURAL ENGINEER'S DEPARTMENT.

Classified as famine boring under G. R. No. 7075.

Serial No.	Name of well-owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of the bore
1	2	3	4	5	6	7
<i>Dharwar District.</i>						
1	Mr. Basavantappa Jangali.	Gaothan.	Ranebemur	Tinnikatti.	Well 40' x 10' x 10'	3½"
2	Mr. Halappa Basappa Valikat.	22	Do	Do.	Well 35' x 31' x 24'	3½"
3	Mr. G. A. Korahalli Naik	Gaothan.	Navalgund	Annigiri	Well 36' x 6' x 7'	6"
<i>Bijapur District.</i>						
4	Mr. G. S. Pattanada	Gaothan.	Badami	Badami	Surface	3½"
5	Shrimant Shankarappa Desai.	Do.	Do.	Sufa	Do.	3½"
6	Gugwad Ginning Factory.	Do.	Bagalkot	Bagalkot	Well 35' x 20' x 20'	6"
<i>Ahmednagar District.</i>						
7	Mr. H. G. Girme	Gaothan.	Kopergaon	Belapur	Well	6"
<i>Kolaba District.</i>						
8	Mr. Allisab Mahamood	Gaothan.	Mangaon	Morba	Surface	6"
<i>Nasik District.</i>						
9	Mr. Damodardas Savai-ram.	490	Niphad	Kherwadi	Surface	3½"
10	Mr. Baharam Nandaram.	Gaothan.	Do.	Do.	Do.	2½"
11	Mr. R. D. Kulkarni	Do.	Nandgaon	Nayadougri	Do.	6"
<i>East Khandesh District.</i>						
12	The President, Municipality.	Gaothan.	Rrandole	Dharangaon	Well	3½"
<i>West Khandesh District.</i>						
13	Mr. Jaychand Somchand Shaha.	222	Nandurbar	Nandurbar	Well 25' x 49' x 33'	6"
<i>Poona District.</i>						
14	The Principal, Law College.	52	Haveli	Yerandavna	Surface	6"
15	Mr. K. R. Sathe	Gaothan.	Do.	Bhamburda.	Do.	6"

BORING SCHEDULE FOR 1930-31.

dated 28th November 1925.

Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	Number of gallons increased per hour by boring	Well-owner's expenses on			Average Departmental expenses on the bore including
				Labour charges	Cost of fuel, lubricating oil, coal, carting, casing, cutting shoe etc.	Departmental charges for the well-owner called flat charge	Super-vision and Depreciation charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
58' 0"	<i>Nil.</i>	200	200	172 8 0	7 0 0	62 0 0	118 6 8
43' 4"	268	468	200	121 8 0	6 11 0	48 8 0	88 18 0
200' 0"	<i>Nil.</i>	30	30	300 0 0	1,000 0 0	<i>Nil.</i>	1,088 8 8
38'	..	..	..	....	....	....	....
70'	..	..	..	....	....	....	....
36' 0"	<i>Nil.</i>	250	250	45 5 6	158 8 0	36 8 0	198 10 6
200' 0"	<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>	75 0 0	124 12 0	<i>Nil.</i>	1,088 8 8
200' 0"	<i>Nil.</i>	1,000	1,000	160 0 0	742 9 3	275 0 0	1,088 8 8
82' 6"	<i>Nil.</i>	48	48	46 6 0	5 0 0	<i>Nil.</i>	142 10 6
76' 0"	<i>Nil.</i>	4	4	55 8 0	1 0	<i>Nil.</i>	131 6 8
64' 0"	<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>	....	....	....	....
50' 0"	..	..	..	....	....	....	....
127' 0"	<i>Nil.</i>	250	250	113 4 0	849 10 9	165 8 0	691 3 7
200' 0"	<i>Nil.</i>	0.75	0.75	237 2 0	281 3 0	<i>Nil.</i>	1,088 8 8
150' 0"	<i>Nil.</i>	250	250	110 0 0	196 2 0	200 0 0	816 6 6

AGRICULTURAL ENGINEER'S DEPARTMENT

Classified as famine boring under G. R. No. 7075,

Serial No.	Name of well-owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Average Departmental expenses on the bore including
						Running expenses, Mechanic's wages and Repairs
1	2	3	4	5	6	16
	<i>Dharwar District.</i>					Rs. a. p.
1.	Mr. Basavantappa Jangali.	Gaethan.	Ranebennur	Tuminkatti.	Well 40' x 10' x 10'	249 8 4
2	Mr. Halapa Basappa Valkar.	22	Do	Do.	Well 35' x 31' x 24'	187 2 3
3	Mr. G. A. Korahalli Naik.	Gaethan.	Navalgund.	Annigiri	Well 36' x 6' x 7'	1,708 5 4
	<i>Bijapur District.</i>					
4	Mr. G. S. Pattanada	Gaethan.	Badami	Badami	Surface	..
5	Shrimant Shankarappa Desai.	Do.	Do.	Sulla	Do.	..
6	Gugwad Ginning Factory.	Do.	Bagalkot	Bagalkot	Well 85' x 20' x 20'	311 12 4
	<i>Ahmednagar District.</i>					
7	Mr. H. G. Girme	Gaethan.	Kopergaon	Belapur	Well	1,708 5 4
	<i>Kolaba District.</i>					
8	Mr. Allisab Mahmood	Gaethan.	Mangaon	Morba	Surface	1,708 5 4
	<i>Nasik District.</i>					
9	Mr. Damodardas Savai-ram.	499	Niphad	Kherwadi	Surface	354 14 9
10	Mr. Balaram Naadaram	Gaethan.	Do.	Do.	Do.	326 15 4
11	Mr. R. D. Kulkarni	Do.	Nandgaon	Nayadongri	Do.	..
	<i>East Khandesh District.</i>					
12	The President, Municipality.	Gaethan.	Erandole	Dharangaon	Well	..
	<i>West Khandesh District.</i>					
13	Mr. Jaychand Somchand Shaha.	222	Nandurbar	Nandurbar	Well 28' x 49' x 33'	1,084 12 3
	<i>Poona District.</i>					
14	The Principal, Law College.	52	Haveli	Yeraandavna	Surface	1,708 5 4
15	Mr. K. R. Sathe	Gaethan.	Do.	Bhamburda	Do.	1,281 4 0

BORING SCHEDULE FOR 1930-31—contd.

dated 28th November 1925—contd.

Cost of bore to the well-owner. Total of columns 12, 13 and 14	Cost per foot to the well-owner	Grand total cost of bore inclusive of well-owner's and departmental cost. Total of columns 15, 16 and 17	Grand total cost per foot	Object of Boring, i.e. Agriculture, Gardening or Drinking	Remarks, i.e. Successful, Unsuccessful, Incomplete, On hand and Abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
241 8 0	4 2 8	606 7 0	10 8 2	Drinking ..	Successful, last year's work 36'.
171 11 0	8 14 8	447 10 8	10 4 5	Gardening ..	Successful.
1,800 0 0	6 8 0	3,096 14 0	15 7 9	Drinking ..	Unsuccessful, last year's work 127'.
....	....	....	....	....	Unsuccessful, details not received.
....	....	....	....	....	Do. do.
235 5 0	6 7 0	745 11 10	20 6 7	Drinking ..	Successful.
199 12 0	0 15 11	2,996 10 0	14 15 9	Drinking ..	Unsuccessful, last year's work 183' 8".
1,177 9 3	5 14 2	3,974 7 5	19 13 11	Drinking ..	Successful, last year's work 91' 0".
51 0 0	0 10 0	549 15 8	6 10 4	Agriculture ..	Unsuccessful, last year's work 81' 8".
67 0 0	0 12 0	515 6 0	6 12 6	Drinking ..	Unsuccessful.
....	....	....	....	....	Abandoned at owner's request. Last year's work 16'. Details not to hand.
....	....	....	....	....	Test to be taken, details not to hand.
628 6 9	5 11 9	2,404 7 9	18 15 0	Agriculture ..	Successful, last year's work 98' 7".
468 5 0	2 5 6	3,265 3 0	16 5 3	Drinking ..	Unsuccessful, last year's work 160'.
506 2 0	2 8 6	2,608 12 6	13 0 4	Do. ..	Successful.

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

APPENDIX P.

SUMMARY OF WORK DONE UNDER THE HORTICULTURIST TO GOVERNMENT, BOMBAY PRESIDENCY, POONA, FOR THE YEAR 1930-31.

Staff.—Dr. G. S. Cheema was in charge of the Section till the 10th of May 1931 when he went on deputation to England to study problems of marketing fruits in foreign countries and Mr. H. P. Paranjpye was appointed to act in his place. Mr. Paranjpye, District Horticultural Officer, was on leave for three months from February to April 1931. Mr. P. G. Dani was appointed to act as District Horticultural Officer and Mr. G. B. Deshmukh as Superintendent, Ganeshkhind Botanical Gardens, Kirkee, in Mr. Dani's place. Mr. I. A. Sayed is a new Graduate Assistant appointed during these acting vacancies. Mr. S. M. Patel is a new Graduate Assistant under the Vegetable Research Scheme.

Laboratory Work.—During the year under report attention was chiefly directed to the study of preservation of fresh juice of Jambul fruits (*Eugenia Jambolana*) which is supposed to have highly anti-diabetic properties. It is found that this juice can be preserved well if pasteurised at 70° C for 30 minutes. Carbonation of the juice was found to have no effect in preserving the original colour of the juice.

Strained tomato juice keeps well, preserving the flavour and odour of fresh tomatoes in bottles. When salted to one per cent., the colour of the juice above the sediment was clear golden yellow, whereas it was slightly dull when not salted. This makes a very good beverage with sugar to taste. In order to get over the sediment repacking of the juice will be tried.

Publications.—"Phalzadacha Bag" or "Cultivation of fruit crops" in Marathi by Mr. H. P. Paranjpye was republished and its Kanarese version was also published by Mr. S. S. Bhat. These are useful books in advisory work.

Transport of mango fruits.—Three dozen fruits of each of Alphonso, Shendra and Cawasji Patel varieties have been despatched to Dr. S. S. Zilva of the Lister Institute, London, for four weeks for determination of vitamin contents. These fruits were shipped in P. and O. Mail Steamers and were stored in the purser's cool room with a temperature ranging from 40 to 45° F. The fruits have reached in good green condition.

Ganeshkhind Botanical Gardens, Kirkee.

Season.—The total rainfall during the year was 29·18 inches with 96 rainy days. July and August had 26 and 22 rainy days respectively. May and November had 1·38 and 1·19 inches rain respectively.

Remodelling Scheme of the garden reported last year is now in full swing. Plot No. 14A was planted with new grafts of different varieties of guavas. Each row of plants represents a distinct variety and will serve as stock plants for propagation and distribution of different strains.

Plot No. 14B newly levelled and green manured, is planted with high yielding strains, viz. Lucknow No. 49. The intervening space was used for brinjals in cold and hot weather,

Plot No. 12A is planted with Basrai Banana to test its suitability and its commercial value in the Deccan conditions. This will also be compared with the other common local type called Rajapuri which is grown in another plot No. 12B.

Plot No. 13A was levelled at a considerable cost and green manured and was planted with Washington Papaya in November last. This will form a rotation crop with Basrai Banana.

Further progress in remodelling of the garden consists in the construction of two bridges making two plots 16A and 16B easily accessible from plot No. 15 with suitable roads. Half of the area of plot No. 15 is subdivided into suitable sub-plots. These are levelled and are ready for planting with trees. Similarly plot No. 11A is cleared of the jungle vegetation and will be levelled next year. Plot No. 11B is also cleared by removing the old orange plot and is ready for planting grape vines.

Crops.

Mangoes.—The Mango season of 1931 was very poor all over the Deccan and the crop of the Ganeshkhind Gardens was particularly so. The estimated crop was about two annas in the rupee and fetched by auction Rs. 250 only.

Jambul.—The plantation of Jambul grafts (*Eugenia Jambolana*) in plot No. 3A planted in 1925-26 has grown into small bushy trees but has not yet fruited.

Foreign figs.—These plants have made tolerably good growth but the fruits that appear on the trees do not set and ripen on the tree satisfactorily. Probably they do not take kindly to the Deccan conditions or they are still in the process of being acclimatised.

Guavas.—The season was a favourable one. The selected improved varieties of Lucknow, Nasik and Hyderabad have given very good yield.

Pomegranate.—The Kabul pomegranate type reported last year has not kept up its standard; the yield was poor and the fruits were small.

Banana.—Seedlings of Yella-bali variety have all fruited and each fruit invariably contained a number of seeds. Three bunches were harvested from the off shoots of seedling No. 2 of Sonkel-chanda and they have maintained the high colour quality and flavour but the stalk of the fruit is weak which is a defect from a commercial point of view.

This year the scheme of improving chillies and brinjals has been taken in hand and it is financed by the Sir Sassoon David Trust Fund. For the present 55 samples of chillies and 50 brinjals are collected from different tracts of the Presidency and are sown in the present Kharif season.

Out of the foreign varieties of brinjals grown in the last Rabi season two types viz. Black Beauty and New York Improved Purple have done well in Poona conditions.

Modibag Gardens, Poona.

Season.—Total amount of rainfall recorded in the Modibag Gardens was 33.65 inches as against 20.57 inches in the previous year. The

rainy days in the year were 101 as against 87 in 1929-30. The months of September, October and November had almost double the rainfall of the previous years. Owing to heavy rains in October and November the usual treatment of grape vines and figs could not be satisfactorily given. This coupled with the cloudy weather of December brought on downy mildew on grapes and rust on figs. The summer season was also characterised by high temperatures which rose to 108° F. for many successive days. The usual interval of canal irrigation turn was extended from 10 days to 12 or 13 days. Consequently crops like Banana and nursery plants suffered much from drought in spite of mohots working for full day. In short the season was an unfavourable one for fruit crops.

Financial position.—There was a reduction of Rs. 517 in the total budget of the garden and there was a fall of about Rs. 400 in the total receipts of the garden mainly due to the unfavourable season and partly to the destruction of old banana and papaya plots which were renewed at the commencement of the year under report. General fall in the price of agricultural garden produce was also largely responsible for diminution in the total receipts of the garden.

Santra Orange.—This plantation was treated for Mrigbahar which responded very satisfactorily. The average number of fruits borne comes to 340 while the maximum number recorded for a tree was 970. The crop was sold by contract for Rs. 300. The number of plants in normal bearing condition was 60. The extreme Southern row of the plantation has not given any good crop during all the previous years. It is mostly growing vegetatively on account of the water channel running close to it all the year round.

Mosambi Orange.—The plantation is yielding fruit all the year round like sour-lime and hence it is not treated for any particular crop. Thorough cultivation was given to it at the advent of monsoon with the addition of 100 lbs. of Farm Yard Manure per tree. The average number of fruits harvested per tree during the year averaged 237 giving a total income of Rs. 455 from a plantation of 80 trees.

Navel orange plantation of 35 trees laid out in February 1930 is progressing satisfactorily. Similarly a row of Italian lemons was planted at the same time and these are also in flourishing condition.

Grapes.—Owing to intermittent and cloudy weather in October and November, downy mildew made its appearance and the vines suffered heavily. The Kali and Bhokri vines suffered most though the latter improved late in the season. The inferior variety of Neehum was as usual immune to all these diseases in the season. From an area of 36 gunthas carrying 520 vines of all the varieties, Rs. 140 only were realised.

Figs.—This crop also met the same fate as the grapes. Owing to rains in October the trees could not be treated for "Mitha bahar" and the trees suffered heavily from rust causing early defoliation in spite of three dustings with sulphur. In February new flush appeared which yielded a small crop of average 4 lbs. 7 ozs. per tree.

Pomegranate.—The plantation was as usual treated for Mrig bahar. During the resting period, severe pruning was given to the trees to reduce

extravagant growth. As a result of this pruning vegetative growth predominated and the yield was as low as 18 fruits on an average per tree.

Mango.—Mango trees gave a normal crop this year. The blossom did not suffer either from mango blight or mildew which were prevented by sulphur dusting.

New introductions.—A few grape fruit plants and eureka lemons imported from Sind, have been planted in last February for trial as they are getting into favour with the public. Strawberries were planted at Dhoni near Wai where they were acclimatised for two years and from there a few suckers were brought into the Modibag. A few ripe fruits were harvested. The plants are very healthy and growing vigorously. It is proposed to extend this area for further trial of this crop under Poona conditions.

There was a fall of Rs. 1,100 in the total collections of receipts from fruit; this was partly made up by increased sale of nursery plants and Rs. 1,534 were realised as against Rs. 724 of the previous year.

Advisory Work.

During the year under report 912 enquiries were received. This year only one class was held at the Agricultural School at Rajapur, District Ratnagiri, to teach horticultural operations. Demonstrations in lime juice bottling were held at Rajapur, Dholka, Nadiad, Nasik and Audumber. Jelly making was also demonstrated at Kalewadi and Pimpale in Purandhar Taluka. Mango canning class was largely attended at Ratnagiri, Malwan and Vengurla. In order to create interest in women in food preservation, two demonstrations were held, one in the Seva Sadan, Poona, and another at Khed Shivapur in Poona District. There is thus considerable awakening in the public in the subject of food preservation.

As usual the public were freely assisted in saving their mango trees from the stem borers and no less than 131 mango trees in different parts of the Presidency were operated upon. Similarly 3,061 wild bor trees were budded in different districts particularly in Satara and Kolaba Districts. In West Khandesh one land holder has as many 800 bor trees improved with the help of this Department. 224 Mosambi trees were treated against gummosis. Help was given in catching moths on orange fruits in the rainy season. Considerable help was given to the public in pruning grape vines and in dusting the vines with sulphur. Many more requisitions from the public for this sort of help had to be refused for want of adequate grants for travelling.

From the Modibag gardens plants and seeds worth Rs. 388 were given to the public free of charge for trial.

Trials during the last four years have convinced the agricultural public of the Satara District of the superiority of Basrai banana over the local Rajapuri and people are freely planting this type in preference to the Rajapuri.

H. P. PARANJPYE,

Acting Horticulturist to Government
of Bombay, Poona.

APPENDIX Q.

SUMMARY OF WORK DONE UNDER THE INSPECTOR OF AGRICULTURAL SCHOOLS, BOMBAY PRESIDENCY, POONA, FOR THE YEAR 1930-31.

Staff.—The post was held by Mr. R. Y. Hulkoti throughout the year under the report with the exception of the last 6 days of the year when he was transferred as Cotton Superintendent, Dharwar, and during which period the charge of the post was held by Mr. V. G. Gekhale, Professor of Agriculture, Agricultural College, Poona. The opinions expressed in this report are those furnished by Mr. R. Y. Hulkoti.

One temporary itinerant weaving assistant sanctioned under the Educational Department for a period of six months to train the Agricultural Bias Class teachers in weaving of Fly Shuttle Looms was placed under the supervision of this Office. The District Agricultural staff helped in the examination of both the types of the schools.

Nature of work.—The nature of work has been mainly advisory in connection with both the Vernacular Agricultural Schools and the Agricultural Bias Classes of the vernacular full primary schools. Special refresher classes were arranged and conducted for the benefit of the teachers and supervisors concerned in the work of the Agricultural Bias Classes in the districts of Belgaum, Sholapur, Ahmednagar, Nasik, East Khandesh, Poona, Godhra and Dharwar.

Vernacular Agricultural Schools.

Owing to financial stringency, Government have decided to temporarily close the Agricultural Schools at Surat, Godhra and Jambul from April 1931, Loni, Devi-Hosur and Dhulia only being continued. In order to minimise expenditure on such schools, Government have approved of the principle of starting new agricultural schools on the line of Earning while Learning and a scheme for one such school on the Arbhavi Farm, Belgaum district, has been submitted. The proposed scheme is intended to enable the Local bodies to undertake the work with limited help from Government. The Rajapur High School authorities with the help of the Ratnagiri District Local Board have continued their Vernacular Agricultural School at Rajapur, started during the last year with one of the Graduates, experienced in agricultural education, taken on deputation for the work from the Agricultural Department.

There has been a great increase in the number of applications for admission in the case of all the schools, except Jambul and Godhra, where it has been still difficult to secure a sufficient number of boys. At the former schools, selection had to be made and some applicants had to be refused admission for want of accommodation. The scholarship system was extended from Devi-Hosur, to Loni and Dhulia Schools. At Devi-Hosur 8 students have joined at their own expense without any scholarship. At Loni, it is not so very easy to get boys at a low rate of scholarship. In the case of Dhulia, the boarding expenses are met by the Local Committees by raising contributions from the three Local Boards of West and East Khandesh and Nasik Districts and Dhulia Municipality.

The curricula.—These remained the same as before and more time was devoted to practical work including weaving which has now been introduced in all the schools.

Inspection and Examination.—Inspection visits including the ones for annual examination were paid to the schools, as noted in the subjoined statement. Reports of opinion, advice and suggestions were sent to the Director of Agriculture. The results of the annual examinations conducted with the help of the District Staff of the Agricultural Department are shown below :—

Name of School	Total No. of Visits	No. of students appeared			No. of students passed		
		I year	II year	Teachers	I year	II year	Teachers
Loni ..	6	14	20	4	14	19	4
Dhulia ..	3	17	15	..	15	14	..
Devi-Hosur ..	5	23	15	2	21	13	2
Jambul ..	2	15	10	..	13	10	..
Surat ..	2	13	11	..	10	10	..
Godhra ..	4	17	9	1	13	7	1

All schools except Godhra and Jambul have done well, Devi-Hosur School being the best in every respect. The degree of success in various schools is positively correlated with the amount of interest, efficiency, tact and energy of the Head Masters.

What the past students are doing? The collection of this information has been attempted through the District Agricultural Overseers in so far as their ordinary duties can bring them in touch with the past students. The analysis of the information received during this year is tabulated below :—

Name of School	Year of establishment	Total number of boys passed out from the beginning of the School to the end of 1930-31	Total number of past students about whom reports are received	Past students working on their own farm	
				Total number of those who are carrying on better kind of agriculture from that of the locality	Nothing special
1	2	3	4	5	6
Loni ..	1910	341	38	9	7
Dhulia ..	1923	86	Reports	not	received.
Devi-Hosur ..	1914	171	Do.	do.	do.
Jambul ..	1917	108	9	4	1
Surat ..	1923	84	Reports	not	received.
Godhra ..	1920	108	30	4	5

Name of School	Past students working on their own farm		Service in agricultural Department	Services other than Agricultural Department	Un-employed
	Information not received	Total			
1	7	8	9	10	11
Loni ..	1	17	10	7	4
Dhulia ..			Reports	not	received,
Devi-Hosur ..			Do.	do.	do.
Jambul ..		5	1	2	1
Surat ..			Reports	not	received,
Godhra ..		10	2	13	5

Agricultural bias Classes.

There are 73 of these classes in the Bombay Presidency proper and eight in Sind as detailed in the following statements :—

Name of district	Names of Schools	Total in each District
<i>Karnatak Southern Division.</i>		
Dharwar ..	1. Hulkoti (1) 2. Hosritti. 3. Hansabbavi. 4. Tirapur. (3) 5. Motebennur.	5
Belgaum ..	1. Kougnoili. (1) 2. Kagwad (1) 3. Konnur (1) 4. Kuligod. 5. Parahawad (1).	....
Do. ..	6. Kittur. (1) 7. Hudli. 8. Bedakihal. 9. Chachadi. 10. Manoli.	....
Do. ..	11. Nynasargi. 12. Nandgad. (1) 13. Mugutkhan Hubli. (1).	13
Karwar ..	1. Chendiye. (1) 2. Tergaon	2
Bijapur ..	1. Alm. 2. Bhatgunaki. 3. Kakhandaki. 4. Kaladagi. 5. Neelgund.	5
<i>Central Division.</i>		
Sholapur ..	1. Mohol. (1) 2. Degaon. 3. Muhud Budruk. (2) 4. Kari. 5. Lau (1). 6. Kumbhari.	6
Satara ..	1. Peth. 2. Kale. 3. Bhuiinj. 4. Bhilavadi.	4
Poona ..	1. Narayangaon. (1) 2. Wadgaon (Nimbalkar) 3. Veer.	3
Ahmednagar ..	1. Deolali (1) 2. Jeur. (1) 3. Kanhur (1) 4. Sarole Kasar.	....
Do. ..	5. Alkuti. 6. Dhandarphal (1)	6
West Khandesh ..	1. Kusumba (2) Taloda	2
East Khandesh ..	1. Vaghali. 2. Asoda. 3. Thorgavan. 4. Bhalod. 5. Mhaswad.	....
Do. ..	6. Jamner	6

District	Names of Schools	Total in each District
<i>Konkan Bombay Division.</i>		
Nasik	1. Ozar. 2. Dabhadi. 3. Sukena. 4. Nampur. 5. Vavi.	5
Thana	1. Bardi	1
Ratnagiri	1. Masure. 2. Naringre	2
<i>Gujarat Division.</i>		
Surat	1. Vaghachippa. 2. Godsamba. 3. Vapi	3
Broach	1. Diva. 2. Sarbhon	2
Kaira	1. Uttarsanda. 2. Lamwell	2
Ahmedabad	1. Ashalalai. 2. Jatalapur	2
Panch Mahals	1. Dohod (1) 2. Ambati. 3 Rustumpura (1) 4. Derol.	4
<i>Sind Division.</i>		
Upper Sind Frontier	1. Kashmore	1
Sukkar	1. Amrote. 2. Mirpur. Mathole	2
Nawabshah	1. Khan Wahan	1
Larkhana	1. Mahota. 2. Pathan	2
Karachi	1. Thanu-Bulknan	1
Hyderabad	1. Susri	1

The number of visits paid to some of the schools is shown in brackets. The attitude of the guardians of students and teachers of these classes has been considerably improved by bringing about a proper understanding between the ordinary and the agricultural teachers in respect of these classes through the Refresher classes held mainly for the agricultural teachers and which were also attended by the Head Masters, Supervisors and the Administrative Officers with few exceptions. These Refresher classes were much appreciated and a desire is expressed that such classes should frequently be arranged. Since the development of the Agricultural Bias Class movement depends also on the sympathy and help of the officers of the School Boards and the Educational Department with the active co-operation of the Agricultural Department, it was suggested last year that a joint meeting of all these officers might be found of great advantage. The holding of such a conference has been sanctioned by Government and it is hoped that the proposed meeting will go a great way in removing the practical difficulties and in enabling the movement to develop with longer strides.

Training of Teachers.—This is a very important item to be carefully attended to in developing the Agricultural Bias education movement. For the present this has been taken up by the Agricultural Department. Four teachers at Loni, two teachers at Devi-Hosur and one teacher at Godhra were trained during the year. But the training given here has not as yet been as effective as should be desired, as it is not yet possible

to get men who are in good touch with the agricultural classes. The following statement shows the number of teachers trained and engaged in Agricultural Bias Classes since 1923 :—

Names of Districts	Ahmedabad	Kaira	Panch Mahals	Broach	Surat	Thana	Ahmednagar
Total number of Trained Agricultural Teachers	4	4	5	4	4	4	6
Number of teachers engaged in Agricultural Bias Classes	2	2	4	2	3	1	6

Names of Districts	East Khandesh	West Khandesh	Nasik	Poona	Satara	Sholapur
Total number of Trained Agricultural Teachers	6	6	7	5	6	7
Number of Teachers engaged in Agricultural Bias Classes	6	2	5	3	4	6

Names of Districts	Belgaum	Bijapur	Dharwar	Kanara	Kolaba	Batnagiri
Total number of Trained Agricultural Teachers	18	10	7	3	4	4
Number of teachers engaged in Agricultural Bias Classes	13	5	5	2	....	2

There is a great necessity of the Rural Training School at Narayangaon being improved and developed for training teachers for the Agricultural Bias Classes. Such a rural school also is needed in Kanarese Division where agricultural bias movement has made much head-way and all the three districts of Bijapur, Belgaum and Dharwar have been thinking of a scheme admitting of the introduction of the Agricultural Bias Courses in all the first grade schools of their districts.

V. G. GOKHALE,

Professor of Agriculture,
Holding the charge of the Office of the
Inspector of Agricultural Schools,
Bombay Presidency, Poona.

APPENDIX R.

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF AGRICULTURAL ECONOMICS FOR THE YEAR 1930-31.

This was the sixth year of this new section of the Department. I continued as Professor of Agricultural Economics throughout the year except from 18th April 1931 to 4th June 1931. When I was on leave Dr. W. Burns, Principal, College of Agriculture, held the charge in addition to his own duties. In addition to my duties as Professor of Agricultural Economics I acted as Principal for two months from 1st September 1930 to 31st October 1930.

Mr. T. G. Shirname, B.Ag. continued to be Demonstrator in Agricultural Economics till he proceeded to England on study leave for two years from 1st September 1930. Mr. K. M. Shah, B.Ag. Graduate assistant is acting as Demonstrator in Agricultural Economics in place of Mr. Shirname.

Mr. T. B. Pawar, B.Ag. Graduate assistant continued to be under me for district work. He is engaged in farm costing work at Malsiras in Sholapur district.

The work of my section chiefly consists of (1) Teaching and (2) Research.

(1) *Teaching.*

Agricultural Economics is taught in the junior B.Ag. and senior B.Ag. as a compulsory course and also to the students in the senior B.Ag. class who take Advanced Agricultural Economics as their optional subject. There were 74 students in the junior B.Ag., 75 in the senior B.Ag. and 18 in the optional group of Advanced Agricultural Economics. The subject of compulsory Agricultural Economics goes in the group "General Agriculture" and the result of Agricultural Economics for compulsory course cannot, therefore, be given separately. Nineteen students (including one old student) who had taken Agricultural Economics as their special subject, appeared for their B.Ag. examination. Eighteen passed in all subjects and obtained their degree. One of these eighteen stood in the first class. He was the only student in the first class. For the last three years Agricultural Economics student is topping the successful students in the degree examination.

The optional Agricultural Economics students during the year under report collected first hand information from the village records and in the field at Manjri Budruk, an irrigated village about 13 miles from Poona and submitted separate papers for university examinations along with other papers.

Five B.Ags. have registered for M.Ag. in my section. Three of them have taken up their studies seriously. To coach and guide post graduate students entails lot of work on my part.

(2) *Research work.*

(a) The cost study of farms near Poona with the help of graduate assistant and other similar studies in different districts with the help

of Agricultural Bias school teachers were completed. Draft bulletin on this investigation is submitted to the Director of Agriculture, Bombay Presidency, Poona, under this office No. 11/249, dated 18th April 1931. In all 7 farms were studied for two years and another 7 farms for one year. Only a few observations in connection with this work are made here based on the actual findings of the farms studied without going into details.

(1) Out of the 14 farmers studied, 11 had to take some land on rent.

(2) Rents paid are high. It comes to about Rs. 11-12-0 for jirayat and Rs. 24-8-0 on canals in the Deccan villages.

(3) That the farm families do not get sufficient work on the farm throughout the year. Out of the 21 cases ten farmers could not use more than 30 per cent. of their available days; four could use 30 to 40 per cent. Though much of the idleness was involuntary there were few cases where farmers had employed permanent servants. Such involuntary idleness is inexcusable.

(4) In the sugarcane tract due to the peculiar economy of the sugarcane cropping, farmers could not use more than 30 per cent. of their available bullock labour. It is interesting to note a case of rice farmer near Ratnagiri. He had three bullocks for a small farm of 9 acres and 10 gunthas (with only 1 acre and 2 gunthas under rice). The farmer, due to the peculiar economy of rice farming, could not use more than 82 bullock units out of the 360×3 (or 1,080) available units and yet he had to hire 32 bullock units from outside. This is because the work on rice farm is restricted to two or three months. Nine farmers could utilize between 30 and 50 per cent. and five between 50 and 60 per cent. of the available bullock labour.

(5) Of the 14 different farmers studied 13 owe money to others. The total indebtedness (of the 14 farmers) comes to Rs. 16,491 or Rs. 1,178 per farmer. One took a loan from a relative at 6 per cent., two from co-operative credit societies at the usual rates and ten from Shahukars at 12 to 24 per cent. This shows that there is much indebtedness and that too at high rate of interest. The rate of interest for agricultural business, yielding small incomes, is no doubt high.

The following table shows the "Family labour income" and "Farm business income" of the farms studied.

Name of the unit and locality			Family labour Income			Farm Business Income		
			Rs. a. p.			Rs. a. p.		
Dhurbheda	..	..	—	80	14 0	779	13	0
Kavthi	..	A ..	+	171	5 9	391	5	9
Do.	..	B ..	—	117	13 6	18	10	4
Asoda	..	A ..	—	39	1 10	393	13	7
Do.	..	B ..	—	117	11 2	311	7	8
Ozar	..	A ..	—	67	5 0	99	8	1
Do.	..	B ..	+	14	1 8	205	11	1
Jour	..	..	—	47	0 1	21	15	3
Kanhur	..	..	—	240	13 8	13	7	9

Name of the unit and locality			Family Labour Income	Farm Business Income
			Rs. a. p.	Rs. a. p.
Dhanderphal	..	..	— 96 6 0	95 7 4
Wadgaon	I A	..	+ 134 15 6	475 1 8
Do.	I B	..	+ 488 14 2	862 12 11
Do.	II A	..	+ 351 12 7	619 3 2
Do.	II B	..	+ 249 12 2	562 1 4
Nanded	..	A ..	+ 287 9 5	471 3 9
Do.	..	B ..	+ 216 11 3	368 3 3
Narayangaon	..	A ..	+ 54 8 4	356 5 7
Do.	..	B ..	+ 251 14 9	542 11 0
Shirgaon	..	..	+ 102 11 10	124 12 10
Govankop	I	..	+ 148 5 6	315 0 5
Do.	II	..	— 155 11 3	116 11 4
Total ..			1,511 14 5	7,145 7 1
Average per farm ..			72 0 0	340 4 0

Farm business income means the difference between the value of gross produce of the farm and the out-of-pocket expenses. Out-of-pocket expenditure is taken to include the value of manure, seed, expenses over hired labour, depreciation of dead stock and work animals, feed and fodder consumed by the latter and allowance for their housing and death rate, rent of leased land and assessment and local fund cess on owned land and costs of marketing farm produce. By gross produce we mean all the produce—main produce as well as by-products such as straw and chaff. (The farm produce used by the farmer and his family is included in the gross produce.) Farm business income therefore comes to mean rent of land owned (minus assessment and local fund cess), wages of the labour of the farmer and his family used on the farm, interest on the operating capital and the difference in the value of the gross produce of the farm and out-of-pocket expenditure.

Family labour income means farm business income minus rent of owned land (minus land assessment and local fund cess) and interest on working capital. It thus includes net profits—plus or minus—of the farmer and the wages for the labour of the farmer and his family; while the farm business income includes family labour income, the rent of owned land (minus local fund cess) and the interest on working capital.

The total amount of the family labour income of the 21 units was Rs. 1,511-14-5 or Rs. 72 per family the highest being Rs. 488-14-2. These 21 farm units put in 5,267 days' work on their farms, the daily wage per unit (one man working for a day = 1 unit; one woman working one day = $\frac{1}{2}$ unit) therefore comes to Re. 0-4-7. Since the workers could not employ themselves on the farm throughout the year, the wage, if calculated upon all days of the year, comes to only Re. 0-1-5. The wage of Re. 0-4-7 for gainfully employed days is not bad on one's own farm. The average wage (Re. 0-1-5) for the idle as well as busy days is no doubt very meagre. Though the rent of land and interest on the operating capital come handy to support the family, the total amount is hardly sufficient and hence many farmers have to incur debts.

The total farm business income of the 21 units was Rs. 7,145-7-1 or Rs. 340-4-0 per farm, the highest being Rs. 862-12-11 for a sugarcane farm near Poona and lowest only Rs. 13-7-9 for a farm at Kanhur in Ahmednagar District. The season of 1929-30 for Kanhur was very bad, the crop estimate being six annas. The average amount of "Farm

business income" (Rs. 340-4-0) cannot be called sufficient remuneration for the labour of the family and the investment in land and capital. This income somehow keeps the farmers on the land.

(b) During the year 1930-31 the work of farm investigation is shifted to Malsiras and two villages near it in Sholapur District. Mr. T. B. Pawar, B.Ag., with the help of two temporary Kamgars has been studying 25 farms covering an area of about 600 acres. I visit the places every month. It is hoped that this study will be continued for three years when special report will be submitted.

College of Agriculture,
Poona, 9th July 1931.

P. C. PATIL,
Professor of Agricultural Economics.

**List of Agricultural Bulletins published by the Department
of Agriculture and kept for Sale at the Government
Book Depot, Bombay**

No.	Year	Subject	Price
			Rs. a. p.
32	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa.	0 8 0
33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D.	0 4 0
33	1909	Do. do. (Kanarese)	0 4 0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona	0 4 0
36	1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist	0 14 0
37	1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta	0 4 0
39	1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona	0 5 0
40	1911	The Cultivation of Guavas near Poona, Dharwar and Limbgaon.	0 12 0
41	1911	Groundnuts in the Bombay Deccan	0 4 0
43	1911	An Examination of the Seed-Supply of the Broach District, Part II	0 5 0
44	1911	Preliminary Study of the Red Rot of Sugarcane in the Bombay Presidency	0 8 0
45	1911	Second Year's Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency	0 14 0
46	1911	Seed Selection Series I, Broach Cotton	0 8 0
47	1911	San Hemp	0 4 0
48	1911	Poona Furnace	0 7 0
48	1911	Do. (Marathi)	0 6 0
49	1911	An Examination of the Seed-Supply of the Ahmednagar District, Part I	0 5 0
50	1912	An Examination of the Seed-Supply of the Ahmednagar District, Part II	0 3 0
51	1912	Third Year's Experiments in the Treatment of Grape-Vine Mildew	0 3 0
52	1912	Muscovado Sugar Machinery and its scope for Gul Manufacture in India	0 8 0
53	1912	A Method of improving the Quality of Cotton Seed	0 7 0
55	1913	An Examination of the Seed-Supply of the Poona District	0 3 0
57	1913	Improvement of the Indigenous Plough of Western India	0 12 0
59	1914	Common Salt and its use as Manure in the Konkan Division	0 3 0
62	1914	The Value of Castration of Deccan Bullocks	0 3 0
63	1914	Substitutes for Rab	0 3 0
64	1914	Alkali or Kalar Experiments and Completion Report of Daulat- pur Reclamation Station in Sind	0 14 0
65	1914	A list of diseases of Economic Plants occurring in the Bombay Presidency	0 4 0
67	1914	An Examination of the Seed-Supply of the Sholapur District	0 3 0

No.	Year	Subject	Price Rs. a. p.
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70	1915	Improvement of Cotton in the Bombay Presidency (except Sind).	0 3 6
74	1915	Well Waters from the Trap Area of Western India	0 6 0
79	1916	The Cultivation of Guavas in Gujarat	0 5 6
80	1916	List of Seeds available on the Agricultural College Farm, Poona.	0 5 3
81	1916	Note on Fencing Construction	0 6 9
82	1916	Cultivation of drilled paddy in South Bombay Presidency ..	0 8 0
83	1917	The Spice Gardens of Sirsi in Kanara	0 10 6
84	1917	Seed Selection Series—Kumpta Cotton	0 1 0
85	1917	Note on Cattle in the Bombay Presidency	0 11 0
86	1917	Establishment and Management of the Dairy Farm	0 7 0
87	1918	The Utilisation of Inferior Grass Herbage, Experiments at the Tegur Cattle Farm	0 9 0
88	1918	First Report on Fruit Culture as practised round about Tharushah (Sind) in Nawabshah District	0 2 0
89	1918	Artificial Manures: Experiments on their value for crops in Western India	0 3 3
90	1918	Work on the Manjri Farms for the years 1915-18	0 7 3
91	1919	The Cultivation of Berseem in Sind—Experiments at Sukkur ..	0 1 0
92	1919	Classification and Description of the Jowars of the Bombay Karnatak	0 10 3
93	1919	Palm Gul Manufacture in the Bombay Presidency (principally Date Palm)	1 3 9
94	1919	The Sugarcane Borer and its Control	0 4 3
96	1920	Investigations into the nature of the Salt Lands of Sind ..	0 12 0
97	1920	Prickly-Pear as a Cattle Food	1 4 0
98	1920	Fruit Culture as practised near Shikarpur, Sind	0 1 6
99	1920	Rice Cultivation in the Larkana District, Sind	0 8 0
100	1920	Fodder Crops of Western India	2 1 0
101	1920	Fruit Culture in Palitana and Jamnagar	0 8 6
102	1920	Investigations on Potato Cultivation in Western India	1 15 0
103	1920	The Book of the Mango Do. do. (Marathi).	3 5 0
104	1920	The Ganeshkhind Botanical Garden, Kirkee (Its Genesis and Development)	0 15 6
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106	1920	Dharwar American Cotton: Its History, Cultivation and Improvement	0 7 0
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No.	Year	Subject	Price
			Rs. a. p.
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120	1924	Silage for Fodder in Western India	0 4 0
121	1924	Further Investigation on Potato	0 6 0
72	(Revised 1925)	Experiments with the Automatic Water Finder in the Trap Region of Western India	0 4 0
122	1925	Sugarcane Varieties of Bombay Presidency, India	0 2 6
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125	1925	Some of the promising exotic sugarcane varieties of the Manjri Farm	0 13 0
126	1925	The Bhagnari Breed of Cattle in Sind and Baluchistan	0 6 0
127	1926	Elephant Grass—a new and useful Fodder crop in Western India	0 1 0
128	1926	Cotton cultivation in Sind	0 3 0
129	1926	The treatment of patches of Inferior Tobacco in Northern Gujarat	0 1 6
130	1926	Some useful Forest Trees and Shrubs of the Coastal Tract and their fodder value	0 8 0
131	1926	The Fig Industry of Asia Minor	0 4 6
132	1926	The Improvement of Tobacco in Northern Gujarat	0 4 0
133	1926	Work of the Ganeshkhind Botanical Gardens and Modibag Garden in 1921-25	0 2 0
134	1927	Murrah Buffaloes in Sind	0 2 6
135	1927	An improved method of growing turmeric in the Deccan	0 4 0
136	1927	Cattle Breeding in the Bombay Presidency—Principles and Progress	0 5 6
137	1927	Notes on the Lemon Industry in Italy	0 2 0
138	1927	Injurious Field Rats of Lower Sind and their extermination	0 7 6
139	1927	Sugarcane Mills and small power crushers in the Bombay Presidency	0 6 6
140	1927	Tobacco cultivation in the Southern Maratha Country	0 3 0
141	1927	Trees and shrubs for producing green manure in the Konkan and North Kanara	0 3 0
142	1927	Dry Farming methods in the Deccan	0 6 9
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147	1927	Organisation and cost of gul making in the Deccan Sugarcane tracts	0 2 6
148	1927	Culture of Guava and its improvement by selection in Western India	0 7 3
150	1927	Crops of Sind: their Geography and Statistics	2 1 0
151	1928	Selections in the Jowars of the Bombay Presidency	0 6 0
152	1928	Water-finder work in the Bombay Presidency	0 8 0

No.	Year	Subject	Price
			Rs. s. p.
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158	1929	Preliminary note on the possibilities of the development of Lemon Industry in Western India	0 2 0
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160	1929	Soils of the Bombay Presidency	0 7 0
161	1930	Cattle feeds of Western India	0 1 0
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163	1930	Powdery mildew of the grape and its control in Bombay ..	0 3 0
164	1930	Study in intensive farming, near Poona under Canal Irrigation ..	0 4 0
165	1930	Frost of January 1929 and its damage to crops of the Bombay Presidency	0 6 0
166	1931	Bansi Wheat of the Bombay Deccan and its improvement. (In Press.)	
167	1931	Improvement of Manat Lands in the North Konkan. (In Press.)	